1. Term 1
    1. Continued existence of plants
    2. Propagation by seeds
    3. Reproduction by means of seeds
    4. How seed is distributed
    5. Germination of seeds
    6. Plants that propagate without flowers and seeds
    7. Identifying different types of soil
    8. Interdependece of soil, plants and animals
    9. Organisms that grow under trees
    10. Collecting information about animals and their senses
    11. Dividing animals into groups according to characteristics
    12. The ability of animals to move
    13. Some birds are adapted differently
    14. More knowledge about reptiles
    15. The frog as an amphibian
    16. Extending your knowledge of fish
2. Term 2
    1. Earth the living planet
    2. Some interesting facts
    3. Why life on earth is possible
    4. How soil is formed
    5. What soil consists of
    6. Soil erosion
    7. The importance of water
    8. The atmosphere
3. Term 3
    1. Materials for traditional houses
    2. natural materials
    3. Materials of the distant past
    4. The properties of materials
    5. New discoveries in materials

4. Term 4
    1. Forms of energy
    2. The effect of energy on substances
    3. How energy affects liquids
    4. The wonderful nature of water
    5. Energy as a source of heat
    6. Electricity as a form of heat

Continued existence of plants

NATURAL SCIENCES

Grade 5

Life and way of life

Module 1

The continued existence of plants

Activity

To investigate the continued existence of plants

[LO 1.2, LO 2.1, LO 2.2]

PLANTS

Introduction

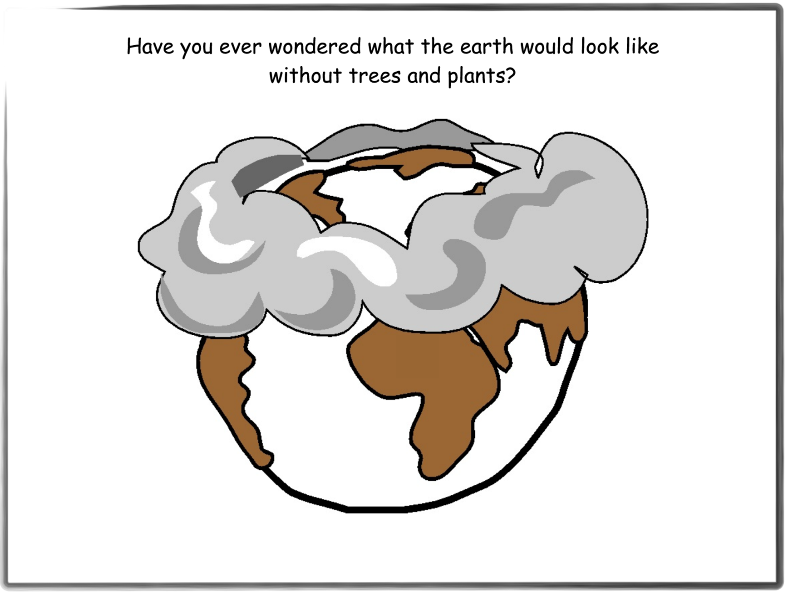
Plants are important for the continued existence of people. Without plants, there would be no life on planet Earth.

Plants produce *oxygen*. Oxygen is an essential gas in the atmosphere that is *breathed in* by people and animals.

Plants provide us with *food*.

Plants provide material for different uses, such as wood, cork, cotton, rubber, etc.

Certain plants contain *healing substances*, such as herbs that can be used as medicine, e.g. buchu, aloe, etc.

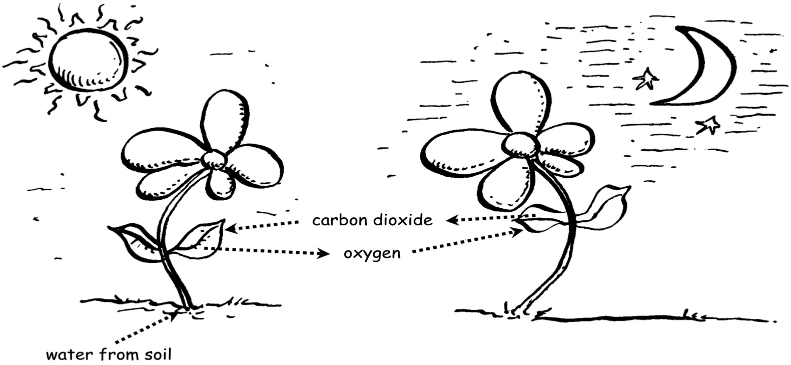


Have you ever wondered what the earth would look like without trees and plants?

What do you think?______________________________

Plants, just like animals, are alive. The difference is that animals move to obtain their food, while plants do not move. Plants are anchored in one place and manufacture their own food. This process takes place in the leaves and is known as **photosynthesis**.

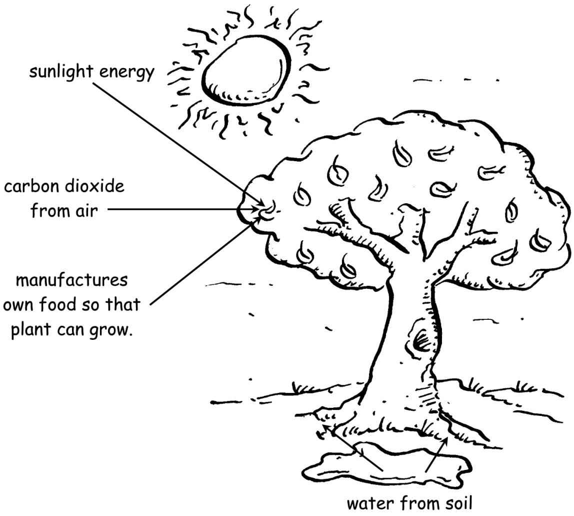
How do plants manufacture their own food?



Plants take up the gas, **carbon dioxide**, from the air, absorb **water** from the soil, capture the **light energy** from the sun in their **leaves** (chlorophyll) and change the water and carbon dioxide into energy-rich **food**.

In this way, the plant is able to grow and also serves as food for animals.

This process takes place only in the day.



Interesting facts

There are approximately 350 000 species of plants, shrubs and trees.

Plants have different shapes and colours.

The leaves and flowers also differ in shape and colour.

This diversity is important for the survival and reproduction of plants, because they will not compete excessively, e.g. some like full sunlight, while others prefer shade.

Name more ways in which plants can differ from one another and therefore not compete with one another.

This is nature’s way of preventing the extinction of a species.

Test your knowledge: Briefly describe where you get the energy that you use every day to come to school, do sport and be able to play:

Group work

Look for information about a tree or other plant that is regarded as endangered species. Write down notes and then give oral feedback to the class about the following:

where it occurs;

why it is regarded as endangered;

what attempts are being made to save the specie from extinction.

Place your notes in your portfolio.

An endangered specie is a type of plant or a type of animal of which very few are left and that will be wiped out completely if they are not given special protection.

Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS

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LEARNING OUTCOME 2: CONSTRUCTING SCIENCE

KNOWLEDGE

The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

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2.1 recalls meaningful information: the minimum requirement is to describe the properties and characteristics of objects, substances and organisms in simple terms;

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2.3 interprets information.

Memorandum

Plants:

many possibilities, e.g. some grow in water, others in dry ground; some are creeping; some have deep roots, others have shallow roots

Learners must do research by themselves to complete the assignment, but the following examples could help learners who are struggling to find the necessary information.

Mountain rose: A type of protea that occurs in the Western Cape. In 1968 there only were ± 10 plants and the plant nearly died out. People who were aware of the value of nature conservation rescued this plant specie and the numbers grew into the hundreds. Seeds were also stored in case of a disaster. It is still protected today, especially against veld fires.

Welwitschia: This plant actually is a dwarf tree and it occurs in the Namib Desert. People believe that the Welwitschia can grow between 1 500 and 2 500 years old. It has long leaves that continue growing throughout the lifetime of the plant.

The blushing bride: Nearly died out – probably the most beautiful South African protea. By 1962, only a few were left in the Franschhoek area. An interesting occurrence then caused them to be saved. A veld fire that broke out in that area caused the seeds to germinate and the blushing bride was saved from extinction.

Propagation by seeds

NATURAL SCIENCES

Grade 5

Life and way of living

Module 2

Propagation in plants by means of seeds

ACTIVITY:

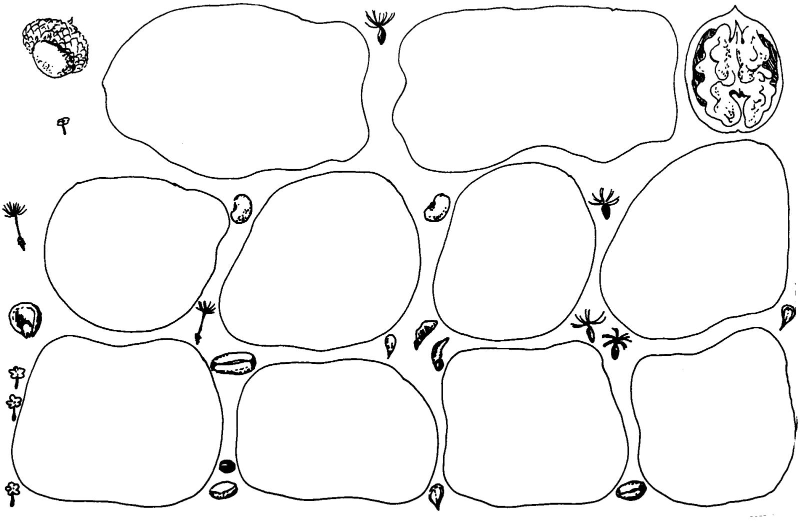
To explore propagation in plants by means of seeds

[LO 1.1, LO 1.2, LO 1.3, LO 2.3]

Propagation by seeds

Have you ever wondered why a plant forms seeds?

Collect as many different kinds of seeds (of flowers, trees, grasses, weeds or wild flowers) and paste them in the spaces below. Exchange/swop with a friend to have a diverse range. Write the names beneath the seeds if you happen to know them!



Now try the following

Collect eight bean seeds and four containers. Place two bean seeds between **moist** cotton wool in each of the three containers. See that the beans are covered by the **moist** cotton wool. The beans in the fourth container must be wrapped in **dry** cotton wool!

Place a container in each of the following places:

1. In a dark cupboard (of which the doors are closed) in a sunny place
2. In an open container in a sunny place
3. In a plastic bag that is closed tightly (the seeds are placed in the bag inside the cotton wool), in a sunny place
4. In a sunny place, but remember to keep the cotton wool DRY at all times!

1. **Wet** the cotton wool every day (not in container no. 4), **observe** daily (at the same time every day) and **record your observations**:
2. The beans in container no. 4 cannot germinate because they did not get any

____

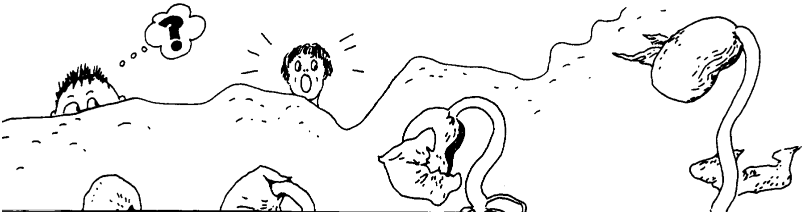
1. The beans in container no. 2
   ______________________ .
2. Those in the dark cupboard
   ____

This means that ________________, is not necessary for germination,

but that____________________is needed, which is brought about by the light.

1. Why did the seeds in the plastic bag not germinate?

____



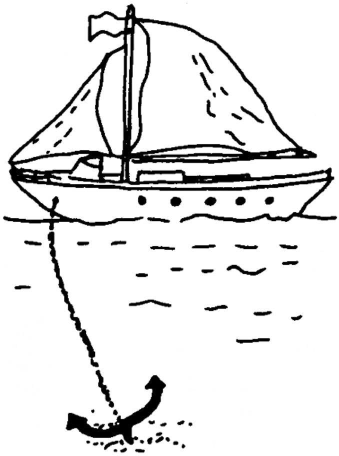
1. A seed or seedling therefore needs the following to grow :

1. ____________________________________
2. ____________________________________
3. Did you notice how soft and wrinkled the seed covers become due to all the water? They eventually burst open and the **radicle** (first root) appears. A few days later the **plumule** (tiny stem and first leaves) appears. The seed has germinated.

1. Why does the radicle appear before the plumule?

____

1. In which direction does the radicle grow and why?



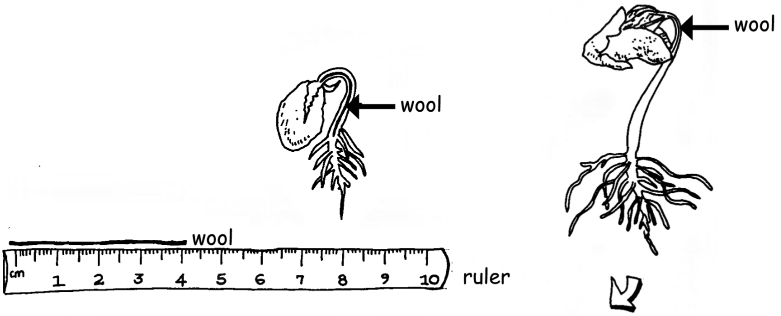
AMAZING

Just like this anchor keeps the ship in one place so that it cannot drift away, so the tap root or other roots anchor the plant firmly in the ground.

The plumule grows upwards in search of sunlight to enable the plant to produce its own food.

1. Use a piece of wool/string to measure how much the radicle and plumule grow daily. Make a pen-mark on your piece of wool to

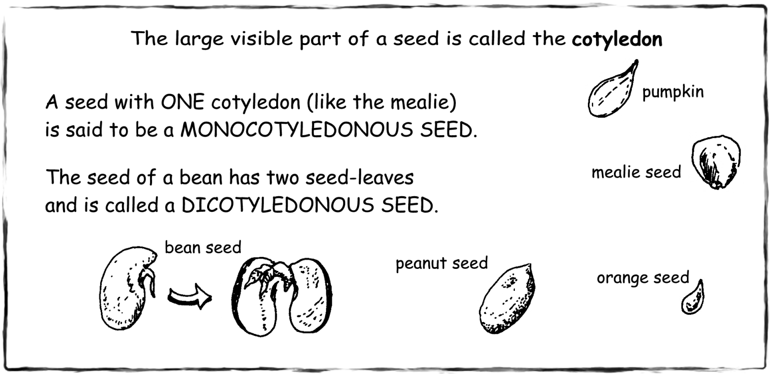
mark the length of the radicle/plumule. Now stretch your wool (from where it begins to the pen-mark) along your ruler to get the correct measurement.



DateLength of radicle in mmDateLength of plumule in mm

1. Now answer the questions that we asked at the beginning: why do plants form seeds?

SOMETHING NEW: Monocotyledonous and dicotyledonous plants



The large visible part of a seed is called the **cotyledon**

A seed with ONE cotyledon (like the mealie) is said to be a MONOCOTYLEDONOUS SEED.

The seed of a bean has two seed-leaves and is called a DICOTYLEDONOUS SEED.

Memorandum

(b) water

(c) germinate

(d) germinate – light

(e) Seeds need air to germinate, and there is too little air in the plastic bag.

(f) (I) air

(ii) water

(iii) warmth

(g)) (i) Why does the radicle appear before the leaf?

To anchor the plant, which is busy developing, in the ground.

(ii) In which direction does the radicle grow?

Down – to anchor – the deeper, the stronger; and to look for

i) water/minerals etc.

Assessment

LEARNING OUTCOME 1:SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

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- interprets information.

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NATURAL SCIENCES

Grade 5

Life and way of living

Module 3

Life cycle of a plant that reproduces

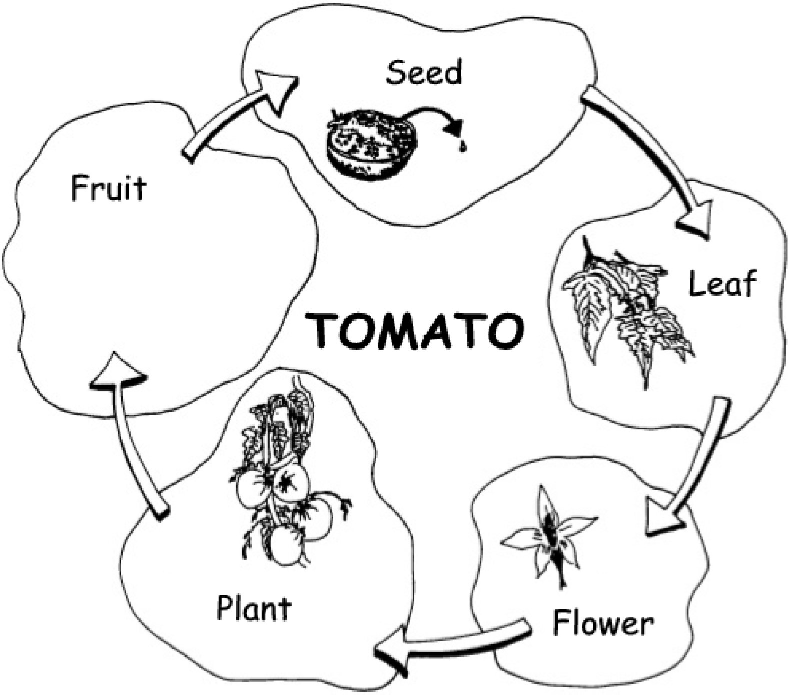
by means of seeds

ACTIVITY:

To investigate the life cycle of a plant that reproduces by means of seeds [LO 1.1, LO 1.2, LO 1.3, LO 2.3]

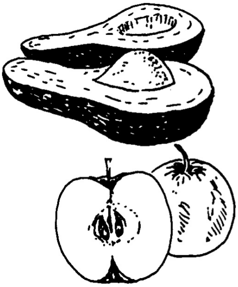
Reproduction in plants that reproduce by means of seeds

Collect a few tomato seeds and take a careful look at them. Paste one of the seeds on the diagram below. The leaf, flower and plant have been drawn for you. You must draw the fruit!

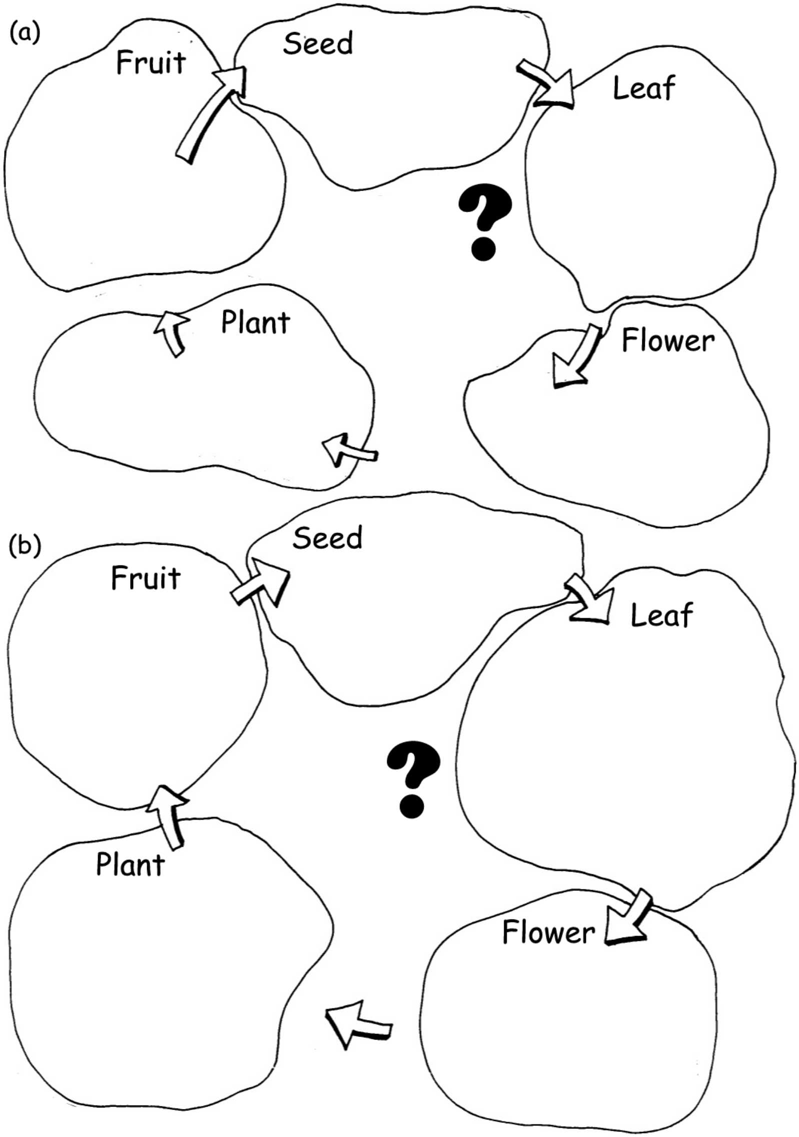


Now collect the seeds of any 2 of the following:

mealie
apple
orange
avocado pear

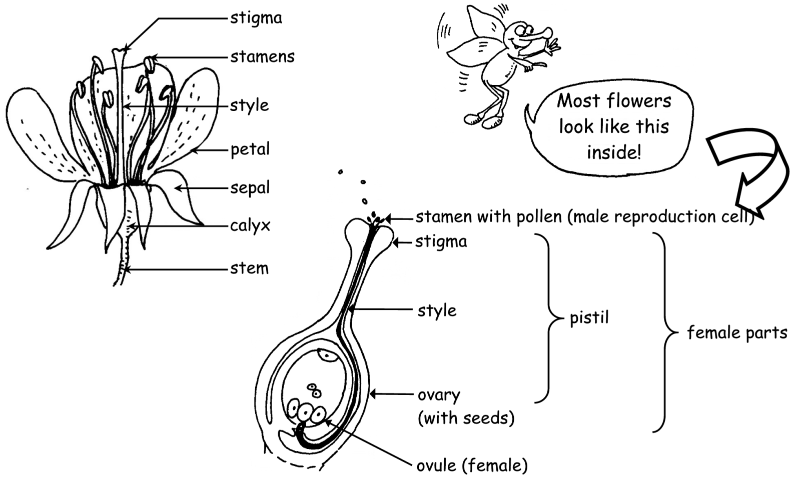


Do the same with two more examples of your choice:



Pollination and fertilisation

Flowers have both male and female parts (on the same flower). The female parts are the stigma, style and ovary. The stamens are the male parts.



A seed can develop only after the ovule has been fertilised. The pollen grains (male reproduction cells) move from the stamens and fall onto the stigma (pollination), from where they grow down the style to the ovary of the flower. The pollen tube grows into the ovule and fertilisation takes place. Now it is possible for the ovules to develop into seeds.

Flowers are mainly pollinated by pollen from other flowers of the same kind. The colourful flowers attract insects such as bees, flies, moths and butterflies. Pollen is then transferred from one flower to another, as the insects move along. The pollen clings to the fine hairs on their legs and bodies.

The wind also causes pollination to take place in certain plants, such as conifers. Other plants are pollinated with the aid of water.

Test your knowledge

1. Write down what you understand by the following:

pollination:

fertilisation:

1. What is the difference between an ovule and a seed?

Assessment

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Memorandum

Life cycle

Sketches of relevant seeds, leaves, flowers, plants and fruit.

Pollination and fertilisation

1. **Pollination** is the transfer of pollen from the stamens of a flower to the stigma of the same flower or of another flower.
2. **Fertilisation** is the fusion of the pollen with the ovule.
3. The **ovule** is in the ovary before it is reached by the pollen. After it has fused with the pollen, it becomes bigger and forms a seed.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 4

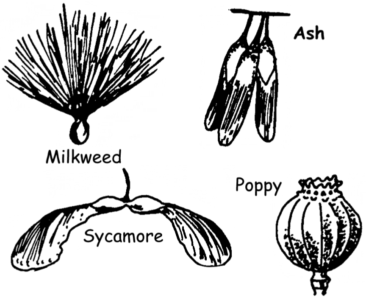
How seed is distributed

Activity:

To investigate and note the way in which seed is distributed

[LO 1.1, LO 1.2, LO 1.3, LO 2.2]

How do plants manage to not all grow in the same place and thereby avoid having to compete with each other unnecessarily?



Dispersal by WIND

Whenever these seeds land on the ground, they are blown away by the wind.

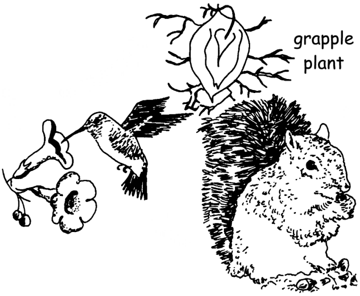
Once they settle in a suitable place, they germinate.

Dispersed by ANIMALS:

Forgotten acorns buried by squirrels often become oak trees.

The hooks of the seed of the grapple plant catch hold of animal's fur and are dispersed in this way.

Fruits and berries are eaten by birds. The seeds inside the fruit are excreted unharmed in the birds' droppings.

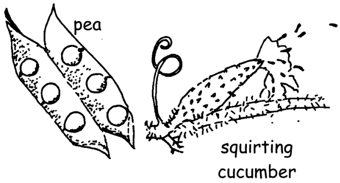


Dispersed by WATER:

Dispersed with an EXPLOSION:

Some seed-pods like the pea explode to release their seeds.

Seeds squirt out in a fluid at one end of the squirting cucumber when pressed.



Something interesting:

What is the difference between a seed and a fruit? Make use of an example (Tip: The one surrounds the other one, in other words, you find the one inside the other one.):

Do your own research on the distribution of seeds. This will mean that you must collect seeds and fruits, divide them into groups according to the ways in which they are distributed, and shortly describe how they are distributed. Your teacher will give you quite a few weeks to complete this assignment so that you can collect a large number of seeds.

Assessment

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Memorandum

Answer to very first questions: The seeds are distributed.

Second question: The seed occurs inside a fruit.

Example: A peach is the fruit and bears a seed inside the pip, or a pea/bean pod is the fruit, with the seeds inside it.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 5

The germination of seeds

Activity:

To discuss in groups the germination of seeds

[LO 1.3, LO 2.1]

Discuss the following questions and write down the answers.

1. Name THREE advantages of having trees and plants on earth:

1. ______________________________
2. ______________________________
3. Supply the names of any TWO types of flowers and also of any TWO trees:

1. ______________________________
2. ______________________________
3. Name THREE ways how to get plants to grow:

1. ______________________________
2. ______________________________
3. Predict what will happen with seeds in:

a warthog hole, 30 cm under the ground: ________________

Reason: ______________________________

fridge:______________________________

Reason: ___________________________________

1. Define the following words: radicle; plumule; dicotyledonous seed

____

____

____

____

____

1. Name THREE ways in which seeds can be distributed. Also mention which is the method that you believe most seeds have become adapted to and why you think so.

Three ways: _________________________________

The most common way and why you think so:____

True or false?

- The radicle will grow in any direction.

____

- Lateral roots grow from the radicle to absorb water.

____

- When the first leaves appear, the cotyledons wilt.

____

Professor Prove-It has confused the process of germination. Please help him rearrange the sentences in the correct order:

- The radicle appears first and grows downwards.
- The cotyledons absorb water and swell.
- The stem grows upwards and the leaves turn green.
- The seed-coat bursts open.
- Lateral roots develop on the radicle.
- Two small leaves appear when the cotyledons burst open.

Assessment

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Memorandum

(I) Provides oxygen

- Decorates our environment and makes it beautiful
- It holds the soil in position – prevents soil erosion
- It provides food, etc.
- It creates places where animals can live, e.g. birds build nests, rabbits live in the soft ground under plants / in the grass.

(b) any suitable answer

(c) (i) Take seeds and sprinkle evenly in a container filled with loamy soil, cover with a thin layer of sand/loamy soil, moisten the soil slightly and place in a sunny place in the garden.

Or

(ii) Take a cutting (only certain plants) – place it in a container filled with water – place in a sunny position until roots appear – then plant in loamy soil etc.

(d) Will not germinate, too little air and warmth.

Also will not germinate. Reason: needs warmth.

(e) **Radicle**: the first root that appears during the germination of a seed

Leaf: the leaf is the flat green section that helps to feed the plant

Dicotyledonous seed: the seed has two cotyledons – two cotyledons at opposite sides of the baby plant

(f) wind; water; animals. No correct answer, allow the learners to debate. There will be reasons why each one could be the most common.

(g) (i) F

(ii) T

(iii) T

(h) (ii), (iv), (i), (iii), (v), (vi).

Plants that propagate without flowers and seeds

NATURAL SCIENCE

Grade 5

Life and way of living

Module 6

How certain plants propagate without flowers and seeds

Activity:

To determine how certain plants propagate without flowers and seeds [LO 1.1, LO 1.2, LO 1.3]

Let us do some research

Before we take a look at whether plants can reproduce without flowers and seeds, let us look at the steps that are taken for scientific research to take place.

The following method is suggested:

The problem:

If you write down the problem related to your research, everyone will know what you are investigating.

At the same time, it helps you to think about what you are going to do and what you will need for the research.

The method:

You explain how you will carry out your research and what you will need.

However, you cannot yet say what you have found out.

Observation:

You make notes of all the information that you gathered or, if it was an experiment, you write down what happened while the experiment was being carried out.

Conclusion:

Now you write down what you found out so that you can share it with other people.

If you tackle your research in this manner, you can be ensured of the fact that you are working like a scientist. A scientist always does research to get questions to his answers. You often also do research without even knowing that you are doing it!

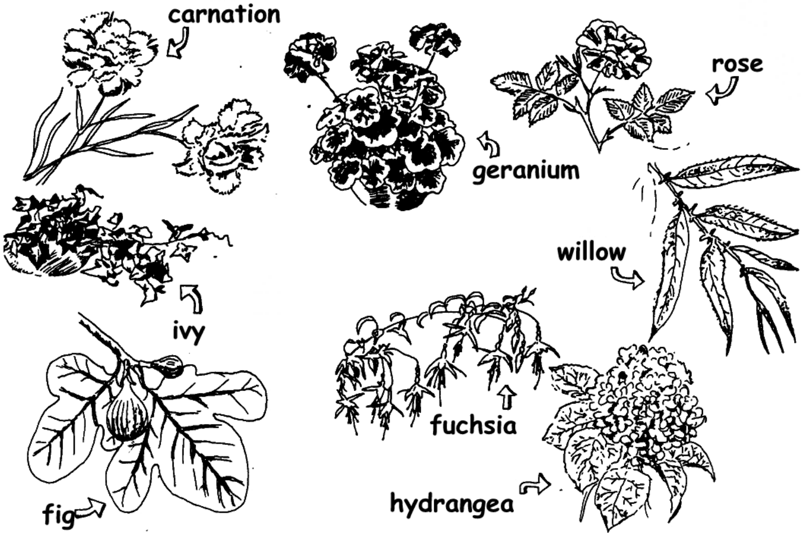
Let us find out something about reproduction in plants.

Problem:

To find out whether new plants can grow from old plants without having formed seeds.

Method:

Cut a leafy twig (about 16 cm long) from any ONE of the following plants which you can acquire in your garden, neighbourhood or vicinity:



Cut all the bottom leaves off the twig. Leave only two or three leaves. We now call the twig a cutting. Plant it in a tin filled with river sand or good soil. Only 8 cm of the cutting may stick out above the soil. Water the cutting well.

Now make holes in a plastic bag and cover the cutting and tin with it. Use an elastic band or a piece of wool (string) to fasten the bag to the tin.

Use the
information above
to sketch what
you must do.
(The final product)
Remember to
label your
sketch!

Observation:

Remove the plastic bag after 6 days and then remove the cuttings from the soil.

Is your cutting fresh and green or brown and dried out?

____

Did something appear at the bottom end of your cutting?

____

If something did, what do you think it is? (leaves, root-hairs, roots)

____

Why did it (iii) develop?

____

Now replant your cutting in the same tin of soil, covered with a plastic bag. Remove the bag every second day (only during the day; cover your plant at night) for two weeks.

The young plant should now be strong and healthy enough to be transplanted into good garden soil! There are however, plants that cannot be propagated by means of cuttings!

Conclusion:

Reproductions by means of cuttings

New plants can be grown from the stems of other plants. Plants with soft, green stems develop roots quickly, whilst plants with woody stems take longer. The process is referred to as **vegetative reproduction**.

Reproduction by means of runners

The strawberry

The mother plant sends out **runners**, eventually forming new plants. This is also an example of vegetative propagation.

Can you name another plant that reproduces with runners?

____

Reproduction by means of bulbs

Certain plants form bulbs underground that later develop into new plants. Cannas, agapanthus and certain lilies propagate in this manner in uninhabited parts across our country.

Millions of bulbs, grown by experts, are sold in our country every year. Just pop them in the ground, water them well and you will be rewarded with a delightful show of colourful flowers at the end of the season!

Dahlias, anemones and daffodils are only a few examples. Visit your local store and see if you can find bulbs for sale. Try to find the names of FIVE more bulbous plants:

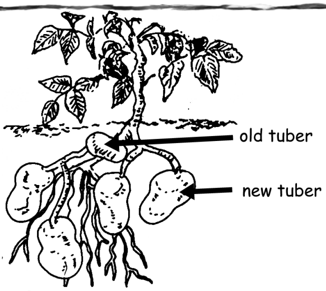
1. ____

2. ______________________________

3. ______________________________

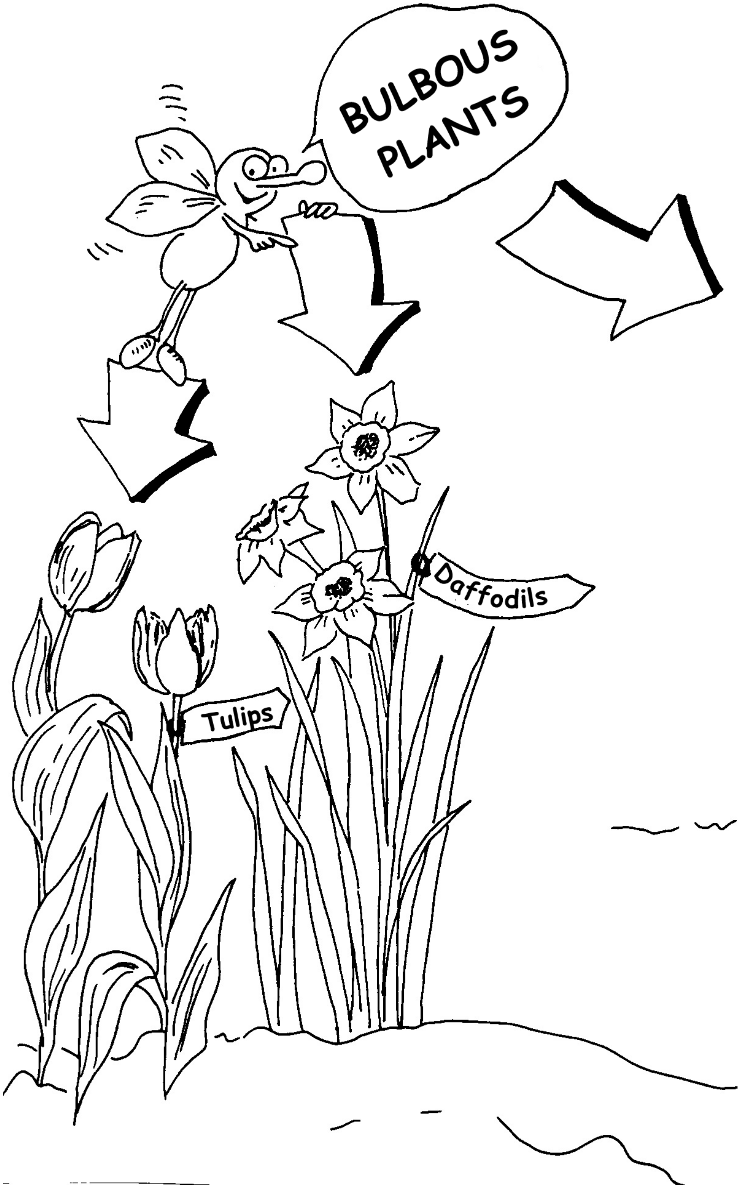
4. ______________________________

5. ______________________________

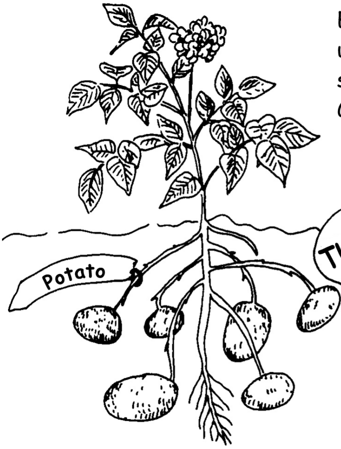


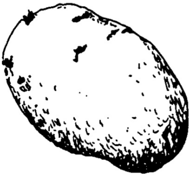
The Potato

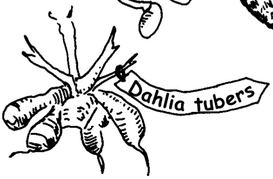
Plant a potato (which has sent out tubers) in good garden soil.

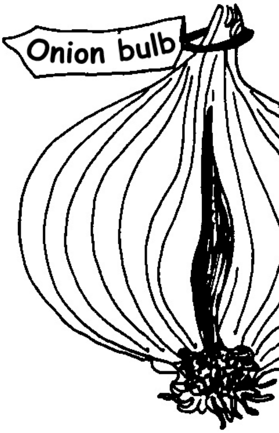

BULBOUS PLANTS
Daffodils
Tulips

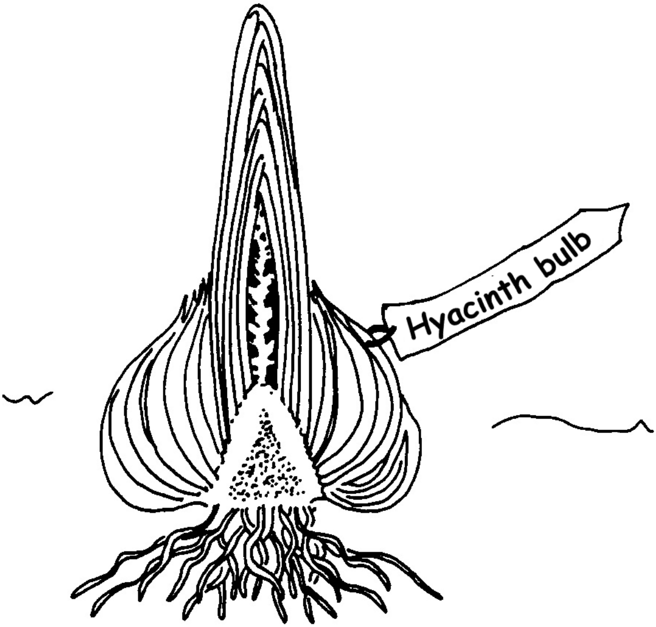
Each potato is a tuber or thickened underground stem. As the plant grows, side shoots from the stem form new tubers. Gradually the old tuber shrinks away.











Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

We know this when the learner:

1.1 plans investigations: together with their co-learners, they list knowledge regarding familiar situations and materials and compile investigative questions;

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1.3 evaluates data and communicates findings: provides feedback on progress in group context and on the final result.

Memorandum

1. Observation

1. fresh and green
2. yes
3. roots
4. The cutting grows and therefore forms a new plant.

(d) Conclusion – own words, but must provide a solution to the problem stated, e.g. plants can reproduce without seeds because roots can grow from cuttings.

(e) Hen and chicken

(a-e) Any examples, e.g. ranunculus, sparaxis, gladiolus, snowdrops, freesias.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 7

Identifying different types of soil

Activity:

To explore and identify the different types of soil

[LO 1.2, LO 1.3, LO 2.2, LO 2.3]

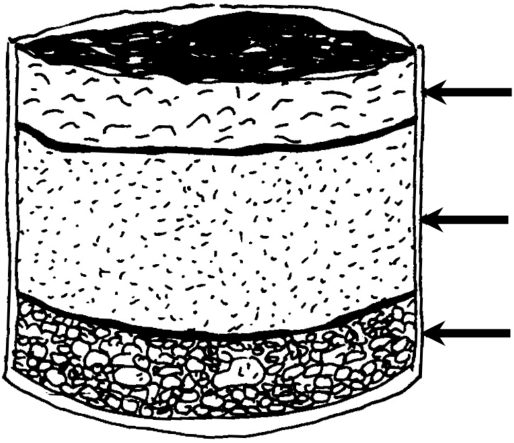
The importance of soil for plants and animals

Before we sow more seeds or plant plants we must first take a careful look at soil. Have you ever wondered how much soil we have on earth and where it came from?

When the earth was formed many, many years ago there were only rocks. Soil formed as the rocks crumbled and the wind and water eroded it. So a layer of soil was formed on the surface of the earth. This process still occurs daily.

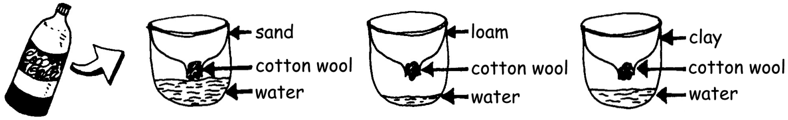
The upper layer of soil (30-40 cm deep) is called topsoil. Beneath it we find a deep layer of subsoil. Beneath that (at the very bottom) a layer of rock is present.

Use this information to label the sketch below:



Let's make a further study of the texture of soil. Because soil varies in colour and composure, it is not the same everywhere!

Firstly you must collect three 2-litre plastic cool drink bottles. (You may use funnels and glass jars if you have). Cut the top parts off with a sharp knife. Arrange the bottles as in the sketch below. Fill the top parts with clay, sandy or loam (good garden) soil, after you have removed the lids of the bottles and placed a ball of cotton wool in each bottleneck. Pour a cup of water over each bottle of soil. How much water passes through?

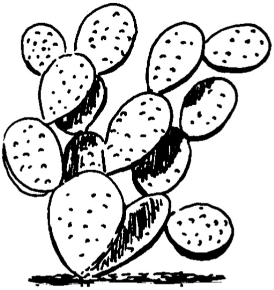


Which soil allowed the most water to seep through?

____

________________________ allowed very little water to escape.

Succulents are plants which grow well in dry (desert-like) areas. They survive by storing water in their thick, fleshy leaves.



Decomposing matter

Plants that grow in soil with a shortage of certain nutrients will not develop into strong plants.

Some farmers do not believe in using artificial fertiliser or manmade chemical substances. They prefer to work leaves, weeds, tealeaves from the kitchen, vegetable peels, etc. into the soil. It is considered natural or organic compost or humus.

Conclusion:

There are THREE types of soil, namely:

CLAY, SANDY AND LOAM(good garden soil)Very fine grains, clinging together. Has coarse, loose grains. It is a good mixture of sand, clay and humus. It maintains (keeps) most of the water absorbed. It holds very little water, most flows away.Holds the right amount of water for plants. It also maintains fertilisers. Fertilisers are washed away. Absorbs and keeps fertilisers. Plants anchor well in clay soil as it is not blown or wasted away easily. Plants are blown or washed away with the soil. Not washed or blown away. Perfect anchorage for plants. Clay soil is always cool. Sandy soil becomes very hot or very cold. Loam maintains a constant temperature. Lacks gases

Though many plants and vegetables grow better in a loamy soil, there are however plants which prefer growing in sand or clay.

Ground nuts,
vines,
tobacco,
maize,
prefer sandy soil

Roses,
grass,
shrubs,
sunflowers,
sorghum,
prefer clay

Fill in the missing words to complete the sentences :

1. ____________ soil retains a large quantity of water because the particles

(grains) are _______________________ and cling to one another.

1. _______________________ soil contains humus.
2. Plants are not anchored well in ________________ soil, because it is easily washed or blown away.
3. __________________ soil absorbs and retains fertiliser.
4. Which soil becomes very cold as well as very warm? _____________

TRUE OR FALSE? WHY ?

1. Clay is the best garden soil.

   ____

____

1. Sandy soil heats up quickly.

   ____

   ____
2. Maize grows well in clay soil.

   ____

____

EXPLAIN

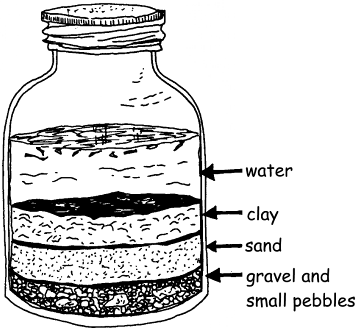
1. Pour two cups of garden soil into a 2-litre Coke bottle or glass jar. Fill the jar/bottle with water. Place your hand over the mouth of the jar and shake it well. Leave the bottle for 3-4 hours.

What do you notice?

____

1. Can you identify the upper and lower layers? (Not the water).

____



1. Take a shoebox and fill it with sand. Take a straw and blow. What happens to the sand?

---

1. Now get two friends to blow with you simultaneously, through their own straws. What happens? Repeat this experiment but this time over the lawn.

---

1. Predict what happens in dry, barren, sandy areas and deserts.

---

1. Complete the following statement: Plants are therefore essential because ___

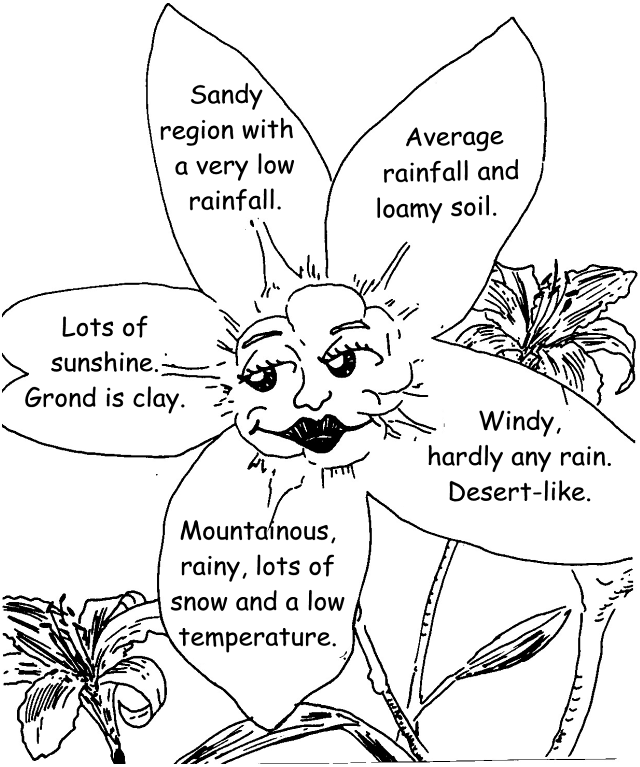
---

1. Which belongs in which petal? Write the

appropriate number of each statement in the petal with the most suitable heading:

STATEMENTS:

- Where vines and tobacco can be cultivated.
- Only succulents will survive there.
- The ground is rich in humus.
- An area where one can ski.


Sandy region with a very low rainfall.
Average rainfall and loamy soil.
Lots of sunshine. Grond is clay.
Windy, hardly any rain. Desert-like.
Mountainous, rainy, lots of snow and a low temperature.

- Fertilizers are washed away.
- Roses, grass and shrubs grow well in this soil.
- The plants have thick, fleshy leaves.
- Many fruits such as apples, pears, etc. will grow

well in this region.
- The soil is always cool.
- Most plants prefer this soil.

Cultivate your own plants (Group Work)

Divide the following tasks:

1. Bring a packet of seeds/bulbs to school.
2. Bring a plastic shopping bag with garden soil to school.
3. Bring a box/container for the soil.
4. Bring a small quantity of gravel.

Do the following:

1. Place a layer of gravel on the bottom of the container.
2. Then fill the container with garden soil.
3. Make holes in the soil, approximately 3 cm deep, with an old pencil. Make sure that they are not too close to one another.
4. Plant the seeds/bulbs.
5. Decide who will be responsible for the following tasks:

- Seeds/bulbs must be watered daily.
- The container must be exposed to the sun for the whole day.
- Daily observation and notes must be made.

All your time and effort will be fruitless if you do not water your plants regularly. The first week after being transplanted is crucial to any plant. Water it daily and later every second or third day. If you live in a wet part of the country you will obviously water your plants less than a person living in a dry part of the country.

Small and medium plants and shrubs prefer a light spray rather than to be drowned in a pool of water.

Assessment

LEARNING OUTCOME 1: **SCIENTIFIC INVESTIGATIONS**The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

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LEARNING OUTCOME 2: **CONSTRUCTING SCIENCE KNOWLEDGE**The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

2.1 recalls meaningful information: the minimum requirement is to describe the properties and characteristics of objects, substances and organisms in simple terms;

2.2 categorises information: creates own category of objects and organisms and explains own rule for categorisation;

2.3 interprets information.

Memorandum

Captions: Topsoil

Subsoil

rock layer

Water: sand

Clay

(a) clay, fine

(b) loam

(c) sand

(d) loam

(e) sand

(f) False, clay contains too little air, no humus, must be loamy soil

(g) True, little water

(h) False, clay contains too little air, no humus, must be sandy soil

(i) It forms layers

(j) Humus (topsoil) / gravel and small stones

(k) It is blown/is distributed

(l) It spreads more / nothing happens on lawn

(m) shifting of sand/dunes takes place continuously

(n) the soil binds and soil erosion is prevented

1. sandy area with low rainfall
2. windy. Rain is scarce, desert-like
3. average rainfall with loamy soil
4. mountainous, rainy, lots of snow and a low temperature
5. sandy area with low rainfall
6. lots of sunshine, clay soil
7. windy, rain is scarce, desert-like
8. average rainfall with loamy soil
9. lots of sunshine, clay soil
10. average rainfall with loamy soil

Interdependece of soil, plants and animals

NATURAL SCIENCES

Grade 5

Life and way of living

Module 8

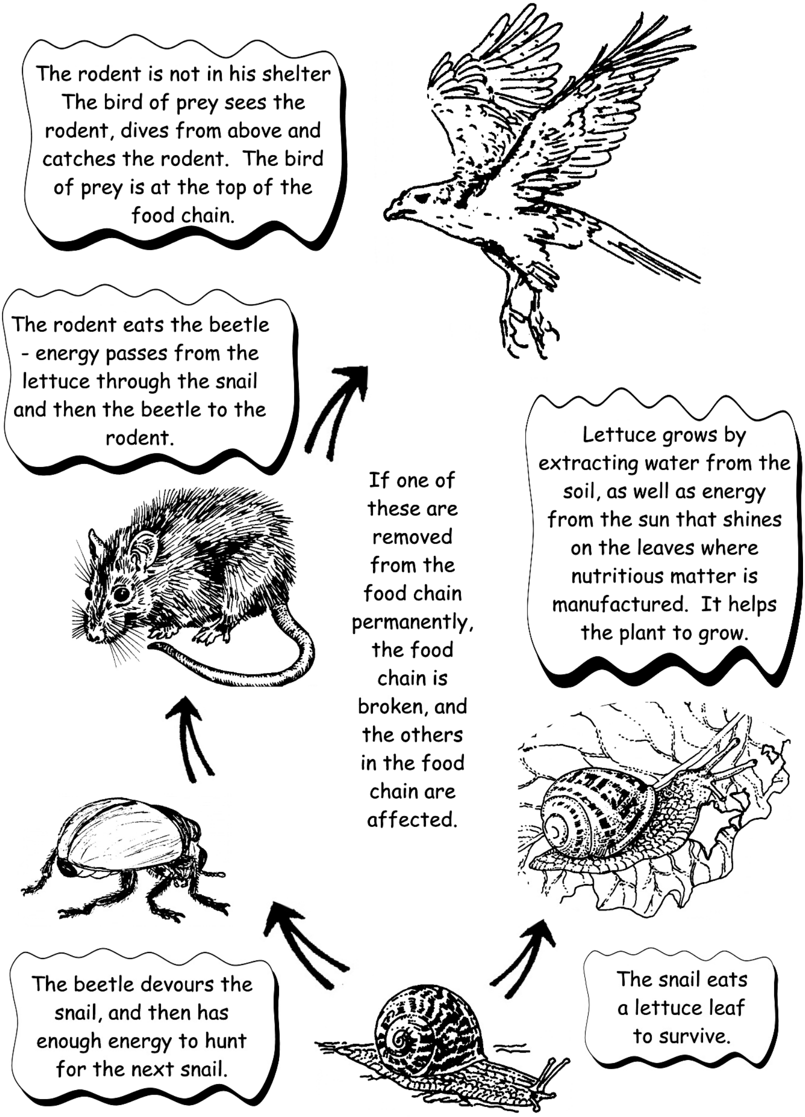
The interdependence of soil, plants and animals

Activity:

To describe the interdependence of soil, plants and animals

[LO 1.1, LO 1.3]

Plants and animals are dependent on one another and on the environment in which they live. Look at the following example of a typical food chain:



Lettuce grows by extracting water from the soil, as well as energy from the sun that shines on the leaves where nutritious matter is manufactured. It helps the plant to grow.
The snail eats a lettuce leaf to survive.
The beetle devours the snail, and then has enough energy to hunt for the next snail.
The rodent eats the beetle - energy passes from the lettuce through the snail and then the beetle to the rodent.
The rodent is not in his shelter The bird of prey sees the rodent, dives from above and catches the rodent. The bird of prey is at the top of the food chain.
If one of these are removed from the food chain permanently, the food chain is broken, and the others in the food chain are affected.

1. Write, in your own words, why soil is important for plants.

1. Animals are very dependent on plants. Why?

However, there also are plants that are poisonous to humans or other animals.

DANGEROUS AND POISONOUS PLANT SPECIES

Poisonous plants that could occur in grazing lands can affect animals and people. Poisonous plants can even cause death.

Research:

In groups of ± four, look for and give oral feedback on the following. Information can be obtained from a library, on the Internet or from your educator.

1. The name of one poisonous plant that is poisonous to people.

____

1. Describe possible symptoms of poisoning.

____

____

5. How must such a person be treated for poisoning? _____________

____

Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

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Memorandum

1. Soil is important because plants grow in it.

2. Plants serve as food for the animals.

3. Poisonous toadstools.

4. Usually nausea, vomiting and upset stomach

5. The stomach must be pumped.

Organisms that grow under trees

NATURAL SCIENCES

Grade 5

Life and way of living

Module 9

The effect of evergreen and deciduous trees on the organisms that live in and under them

Activity:

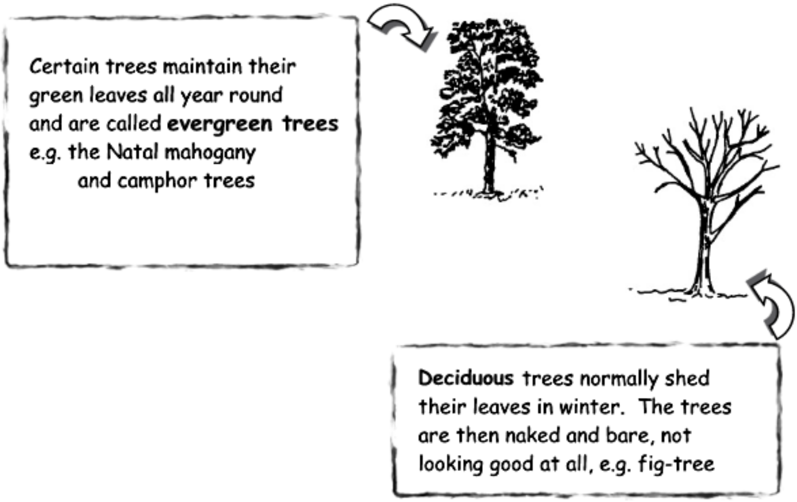
To determine the effect that evergreen and deciduous trees have on the organisms that live in and under them. [LO 1.2]

- The important thing is that the learners must think for themselves and venture answers, e.g.

- birds can make nests in deciduous trees only during certain times of the year
- deciduous trees only provide food for insects at certain times of the year
- the soil under a deciduous tree might be drier and harder than under an evergreen tree
- an evergreen tree always provides shade for plants and animals that like shade, etc.

EVERYTHING THAT HAPPENS IN NATURE IS OF SIGNIFICANCE

For example, look at the following two types of trees:



Certain trees maintain their green leaves all year round and are called **evergreen trees** e.g. the Natal mahogany and camphor trees

Deciduous trees normally shed their leaves in winter. The trees are then naked and bare, not looking good at all, e.g. fig-tree

How does the nature of the two types of trees affect the animals that live in them or under them?

____

____

____

____

Assessment

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Memorandum

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- birds can make nests in deciduous trees only during certain times of the year
- deciduous trees only provide food for insects at certain times of the year
- the soil under a deciduous tree might be drier and harder than under an evergreen tree
- an evergreen tree always provides shade for plants and animals that like shade, etc.

Collecting information about animals and their senses

NATURAL SCIENCES

Grade 5

LIFE AND WAY OF LIVING

Module 10

Collecting information about animals and their senses

Activity:

To collect information about animals and their senses

[LO 2.2, LO 2.3]

Animals are very dependent on their senses for their survival. To be able to survive, an animal must be able to look for food and get hold of it, while remaining aware of the dangers in his environment. Senses play an important role in this regard.

(1) Identify examples of mammals in which a specific sense is developed very well, (2) briefly describe why the sense needs to be developed so well and (3) draw a simple sketches of these animals.

Eyes (vision)

Ears (hearing)

Touch

____

____

____

____

Taste

____

____

____

Smell

____

____

____

Assessment

LEARNING OUTCOME 2: CONSTRUCTING SCIENCE KNOWLEDGE The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

2.1 recalls meaningful information: the minimum requirement is to describe the properties and characteristics of objects, substances and organisms in simple terms;

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2.3 interprets information.

Memorandum

Task: Identify animals. Own research

Examples: eyes – lion; ears – bat-eared jackal; touch – fish (pick up vibrations in the water); taste – herbivores, e.g. antelope (avoid poisonous plants); smell – hyena, antelope.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 11

Dividing animals into groups according to characteristics

1

Activity: To divide animals into groups according to characteristics [LO 2.2]

ADAPTATIONS BY ANIMALS

As we mentioned earlier, plants and animals differ from each other in one aspect in particular. Animals **move**, while plants are **anchored**. Animals are dependent on other animals for their food, or they live from plants. Some animals live on dry **land**, while others live in **water**. Some animals have only two legs, others have four or even more legs. Some even have none at all!

Animals are divided into groups on the basis of the characteristics. Lets us take a closer look:

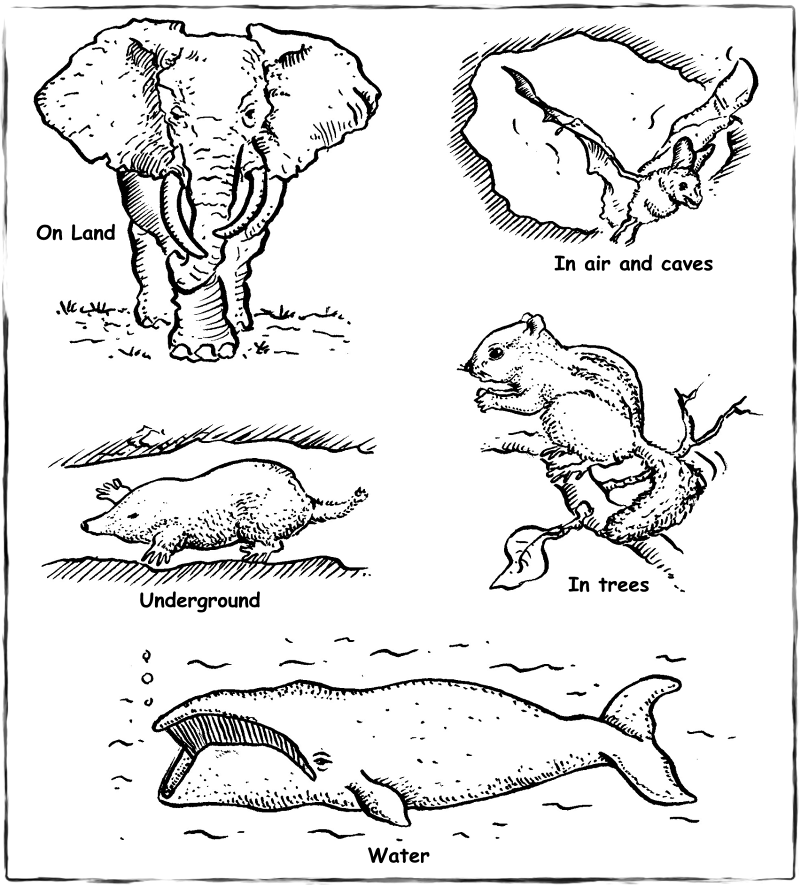
MAMMALS

Mammals feed their young with milk that is produced in the body of the female.

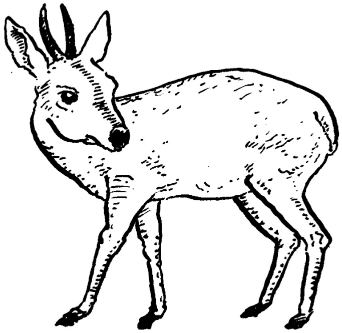
The young are born alive.

Mammals are the only animals with hair or fur (except for the dolphin and the whale).

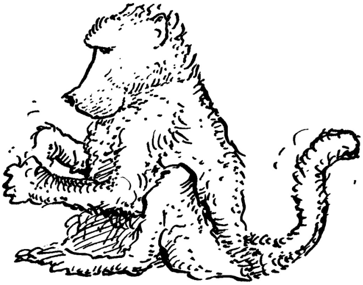
Mammals live:



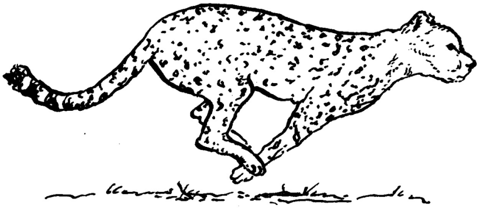
Mammals are adapted to be able to eat different types of food.



Herbivore
(eats only grass/plants)

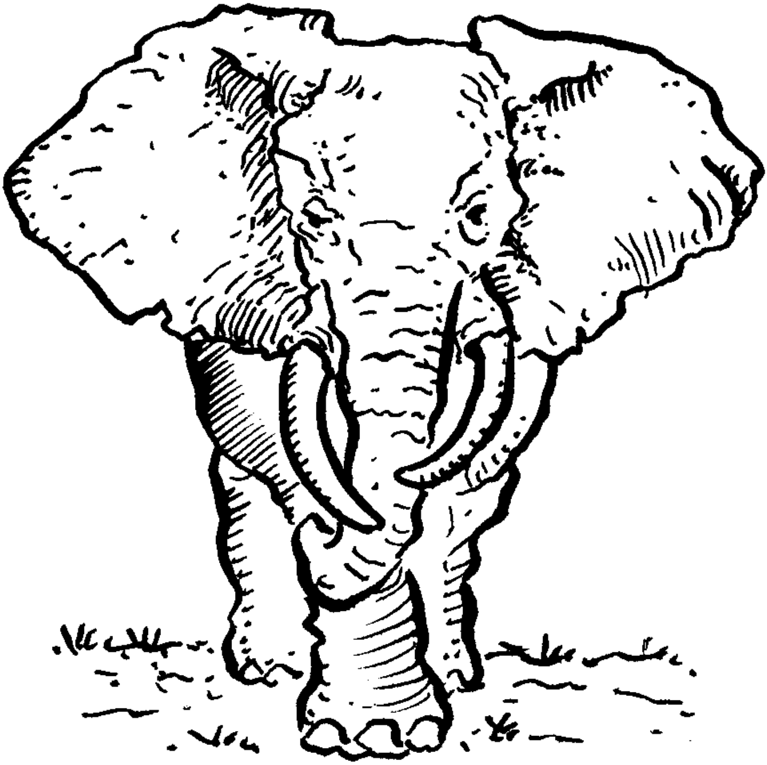


Omnivore
(eats plants as well as meat)



Carnivore
(eats meat only)

Let us take a look at how some animals have adapted to their way of life.



Some people say that elephants have very large ears so that they can hear well. Other people say the large ears play an important role in cooling down their bodies.

What do you think?

Is the elephant a herbivore, a carnivore or an omnivore?

Assessment

LEARNING OUTCOME 2:CONSTRUCTING SCIENCE KNOWLEDGE The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

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2.3 interprets information.

Memorandum

Task:

Some say the large ears serve to cool the animals. There are small veins just under the skin on the surface of the ear. Heat is lost through these veins and this prevents overheating.

The elephant is a herbivore.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 12

The ability of animals to move

Activity:

To investigate the ability of animals to move

[LO 1.2]

ANIMALS AND THEIR ABILITY TO MOVE

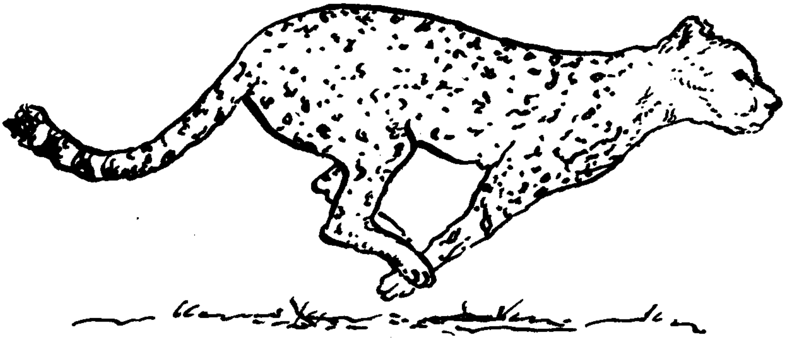
Animals must be able to move so that they can obtain food. Some must even be able to move quickly to be able to catch other animals. Others must be able to move quickly to escape from dangers.

1. The cheetah

Athletic build

Hunts prey by chasing it over short distances

Fastest mammal on land (speed of ± 75 km/h)



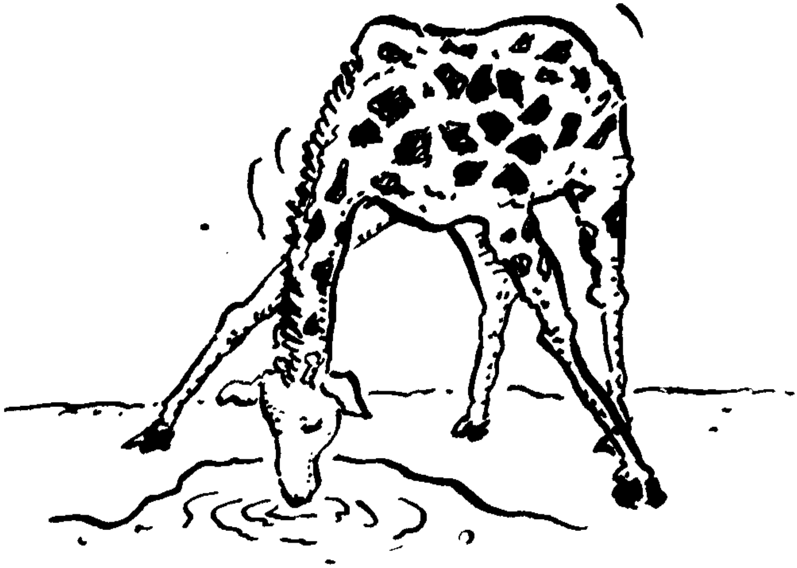
Why must the cheetah be able to run **so very fast**?

2. The giraffe

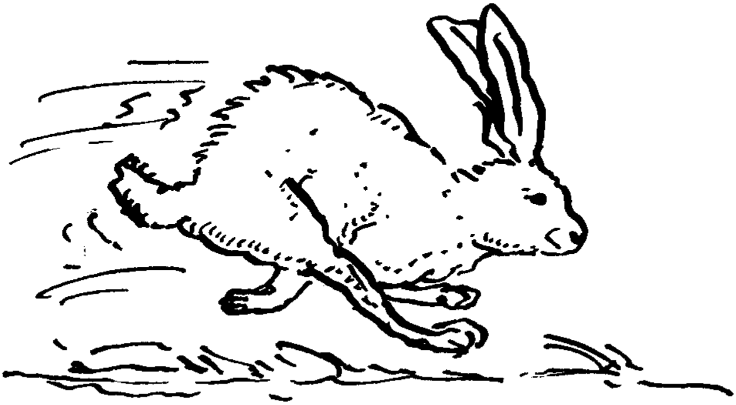
Tallest animal on earth.

Long legs and neck make it possible for it to eat leaves and shoots on the tree tops.

Discuss and draw conclusions about how the giraffe's blood manages to reach its head and why a giraffe spreads its front legs when it is drinking water.



3. The springhare



Long hind legs and short front legs

Moves by jumping with its hind legs

While they eat, they move on all four their legs

How is the springhare’s way of moving adapted to its way of life?

Assessment

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Memorandum

1. Must be faster than antelopes, which are very fast.

2. The veins in the giraffe's neck have special valves that regulate the flow of blood to its head because the neck is so long. When the giraffe bends to drink water, it spreads its legs to prevent too much blood flowing from the arteries into the brain.

3. The hind legs are strong so that it can jump over plants and shrubs and can run quickly to get away from predators.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 13

Some birds are adapted differently

Activity:

To note how some birds are adapted differently [Lo 2.2]

A - mouse-bird, legs only to hold onto branches

B - eagle or falcon (all raptors), strong claws with which to catch prey

C - duck, just like all birds that swim in water: webs to enlarge the surface.

WHAT IS IT THAT MAKES BIRDS UNIQUE?

- They are the only animals with feathers as their skin covering. The feathers keep the bird warm and dry. They also help the bird to fly.
- The front limbs of birds (their ‘arms’) have changed to form wings.
- Birds have air sacs in their legs that make them light so that they are able to fly.
- The sternum in the chest of a bird forms a keel to which their strong flight muscles are attached.
- Birds have a transparent membrane over their eyes so that they can keep their eyes open while they are flying.
- Their eyes are developed very well. Just think of eagles and falcons.
- Birds cannot smell and for feeding are dependent entirely on their sense of taste.

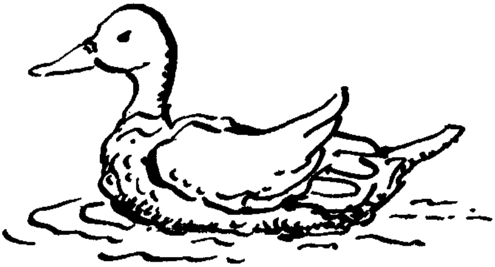
INTERESTING FACTS ABOUT BIRDS

- The **ostrich** is the largest bird species and lays the largest eggs. Ostriches are bred for their eggs, skin, feathers and meat.The ostrich can kick its enemies very hard and can also peck them.
- The Blue Crane: National bird of South Africa.
- The Egyptian goose: The ancient Egyptians regarded this bird as holy.
-

THE FEET OF BIRDS

In pairs: Study the different types of feet and fit the feet to the birds drawn on page 45. Motivate why you decided as you did by referring to their way of feeding and their way of life.

ABC



1. ______________________________
2. ______________________________
3. ______________________________

It will be a good idea to take a look at the beaks of birds when you are at home to see how they have been adapted to the way in which they eat.

Not all birds build nests.

1. Name one type of bird that does not build a nest.

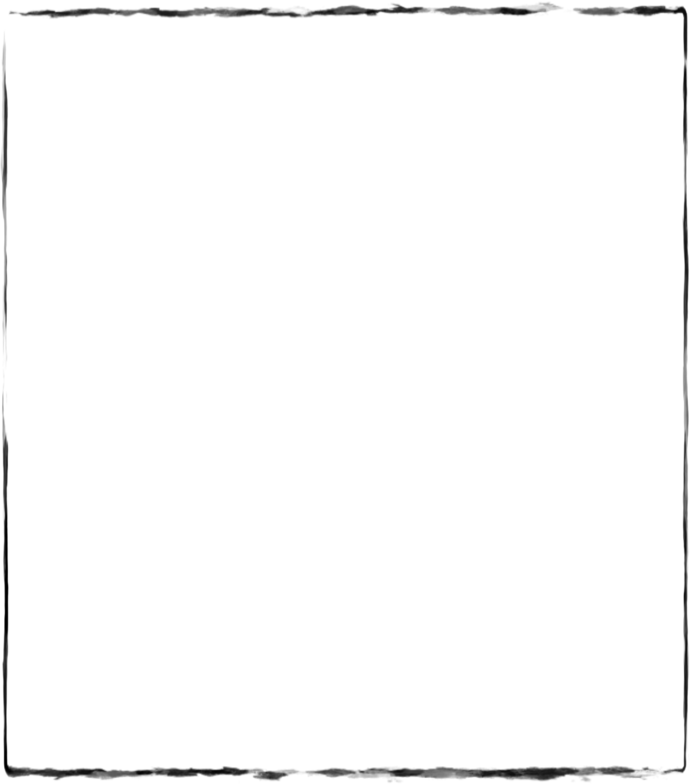
1. Draw a simple sketch of this bird. Also show where the bird lays its eggs.

1. Most birds build nests. Why?

1. Choose one type of bird that you can observe in your environment.

1. Identify the bird.

1. Make a sketch of the bird and its nest.



1. Can you see both the male and the female? Do they differ in appearance? How? Why?

1. How are birds generally adapted to be able to look for food and to be able to get hold of their food?

Assessment

LEARNING OUTCOME 2: CONSTRUCTING SCIENCE KNOWLEDGE The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

- recalls meaningful information: the minimum requirement is to describe the properties and characteristics of objects, substances and organisms in simple terms;
- categorises information: creates own category of objects and organisms and explains own rule for categorisation;

2.3 interprets information.

Memorandum

A - mouse-bird, legs only to hold onto branches

B - eagle or falcon (all raptors), strong claws with which to catch

prey

C - duck, like all birds that swim in water: webs to enlarge the surface

GROUP WORK: Not all birds build nests

1. Cape barn own; rock-kestrel (old nests); most important : plover

3. To lay eggs in at the beginning of spring.

It is seldom used to sleep in.

4c. Why? The male is more conspicuous and can show off to court and impress the female.

4d Birds can fly, they have beaks that are adapted to the type of food they eat and legs with claws that are adapted so that they can sit on brance\hes (when they are looking for prey or eating fruit, for example) and they use them to catch prey. They have well-developed eyes.

NATURAL SCIENCES

Grade 5

Life and way of living

Module 14

More knowledge about reptiles

Activity:

To gain more knowledge about reptiles

[LO 1.2]

Crocodiles, snakes, lizards and chameleons belong to the group of reptiles.

Most reptiles prefer to live in areas with warm temperatures.

Reptiles are cold-blooded and therefore are active when it is warm and passive when it is cold.

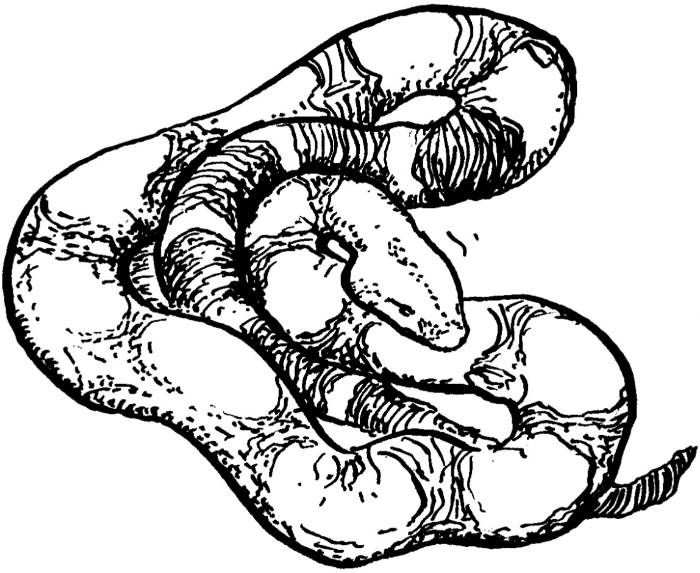
They are crawling animals.

Their skin covering is scaly

The shell of their eggs is mostly leathery.

INTERESTING FACTS

Largest snake: Anaconda from South America
- up to 7,70 m long and weighs more than 200kg.



Can snakes swim? Yes, most of them can.

Snakes

The eyes are situated at the sides of the head and look pearly.

The tongue is usually used to identify smells in their surroundings.

The nostrils are not used for smell.

Unlike other animals, snakes cannot chew their food. What method do snakes use to ingest food that is too big? The jaws are not attached to each other and therefore can be stretched open very widely. The python sometimes swallows small antelope whole.

Look for the following information and complete the questionnaire below:

1. Name at least three types of things that snakes enjoy eating.

____

1. Which snake is known as the “farmer’s friend”, and why?

____

1. Why do sugar-cane farmers like pythons?

____

1. Which snake eats birds’ eggs?

____

1. Do snakes eat other snakes? Motivate your findings.

____

1. Choose one species of snake. Describe this

snake briefly by mentioning some of its most interesting characteristics. Also make a simple sketch of this snake.

1. Which senses are particularly well developed in reptiles?

Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

We know this when the learner:

1.1 plans investigations: together with their co-learners, they list knowledge regarding familiar situations and materials and compile investigative questions;

1.2 leads investigations and collects data: execute instructions and procedures that entail smaller sections;

1.3 evaluates data and communicates findings: provides feedback on progress in group context and on the final result.

Memorandum

Task: In pairs

1. antelope, mice, rats, moles, frogs, birds, etc.

2. Mole snake – eats mice and moles that are pests in the cultivated fields.

3. They eat cane rats that eat the sugar cane.

4. The egg eater

5. Yes – the coral snake in particular does so.

6. Own research.

7. Eyes, smell (tongue)

The frog as an amphibian

NATURAL SCIENCES

Grade 5

Life and way of living

Module 15

The frog as an amphibian

Activity:

To gain more knowledge about the frog as an amphibian

[LO 1.1, LO 1.2]

These animals live on the land and in water.

The tadpole first breathes by means of gills and lives only in the water. The adult frog breathes by means of lungs and can live on dry land or in the water.

The skin of the frog is smooth and moist.

Frogs use their hind legs to jump.

Frogs undergo a metamorphosis, i.e.

1. they first lay eggs
2. tadpoles develop
3. adult frog develops

Investigate and collect: Group work

1. May you take frog eggs or tadpoles out of the water? Motivate

---

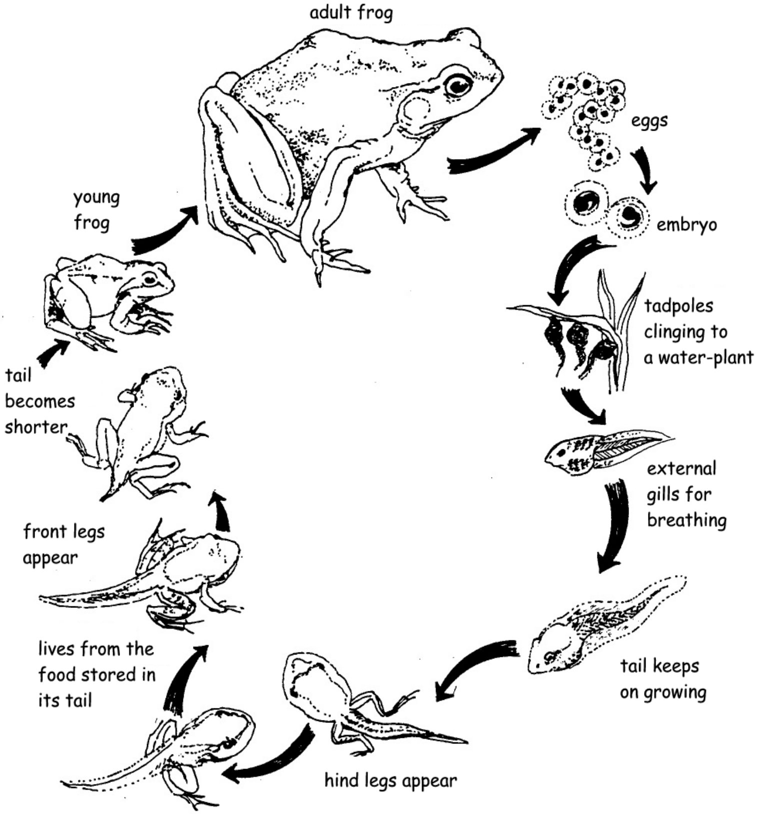
1. How long does it take for a tadpole to hatch?

1. What do tadpoles eat?

1. What appears first? The front legs or the hind legs?

1. Use a dictionary to define the word metamorphosis.

1. Which senses are developed well in the frog?



Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

We know this when the learner:

1.1 plans investigations: together with their co-learners, they list knowledge regarding familiar situations and materials and compile investigative questions;

1.2 leads investigations and collects data: execute instructions and procedures that entail smaller sections;

1.3 evaluates data and communicates findings: provides feedback on progress in group context and on the final result.

Memorandum

Investigate and collect

1. Actually you may not. If you remove tadpoles for observation, you must place them back in the same pool or dam.

2. ± 14 days

3. Tadpoles eat water plants and water animals

4. Hind legs

5. The change from the egg to an adult frog is called a metamorphosis or a change of form.

6. Eyes

NATURAL SCIENCES

Grade 5

Life and way of living

Module 16

Extending your knowledge of fish

Activity:

To extend own knowledge of fish [LO 1.2]

Fish are animals that live in water.

Fish are cold-blooded, breathe through gills and are covered in scales.

Their eggs are usually laid in groups.

Their organ of smell is developed well.

They have a lateral line, which is sensitive to touch and to other stimuli, such as waves in the water.

Interesting facts:

The silvery colour of fish comes from special cells.

A galjoen is dark in colour when it swims amongst the rocks, but lighter when it swims over sand.

Do fish sleep? Yes, but they do not close their eyes and very often just rest on the bottom of the sea or of a dam.

- Describe how a fish is adapted to be able to get hold of food.

- Which senses are developed very well in fish?

Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

We know this when the learner:

1.1 plans investigations: together with their co-learners, they list knowledge regarding familiar situations and materials and compile investigative questions;

1.2 leads investigations and collects data: execute instructions and procedures that entail smaller sections;

1.3 evaluates data and communicates findings: provides feedback on progress in group context and on the final result.

Memorandum

1. Can swim, can see well
2. Eyes, smell, touch.

Earth the living planet

NATURAL SCIENCE

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 17

OUR EARTH: THE LIVING PLANET

ACTIVITY:

To be able to describe the earth as part of the galaxy

[LO 2.1]

One of our finest human qualities is our tendency to **wonder** about things. Students of the natural sciences are encouraged to wonder about the things they see about them.

When last did you wonder about something? Have you ever wondered about the sun? The stars? The universe and where it ends? Whether there are other planets on which there may be life?

When last did you look at the starry skies? Do it again tonight and while you are looking, remember to **wonder** about that which you can see **as well as** that which **you cannot see**:

The stars that you see are suns – they are just much further away from us than our own sun.

We are able to see the stars because they radiate light. It takes the light billions of years to reach us here on earth.

The **universe** is made up of millions of **galaxies**.

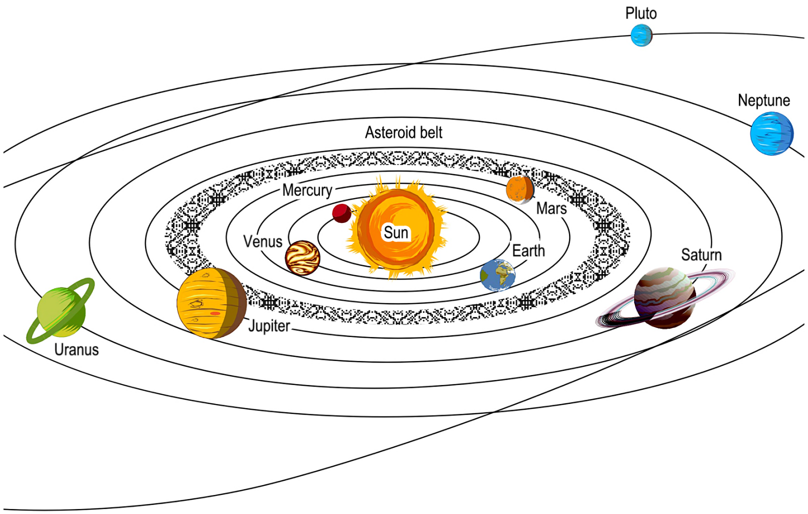
Each galaxy consists of a great number of **solar systems**.

The most visible part of the galaxy of which our solar system is part, is the **Milky Way**.

Of all the stars our sun is the **star** that is the closest to the earth. It consists of a ball of burning gases that radiate light and heat. It is more than 300 000 times the size of the earth.

Our earth is one of nine **planets** that revolve around the sun. It is the only planet that we know of that has life. The other nine planets are (from the closest to the furthest from the sun):

- Mercury
- Venus
- Earth
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune
- Pluto



The course or "path" of a planet around the sun is called its **orbit**.

Many planets have **moons** that revolve around them. Our earth also has its own moon. The moon does not "shine", but because the sun shines on it, the moon appears to emit light.

QUESTIONS:

1. Why can we say that the earth is a planet?

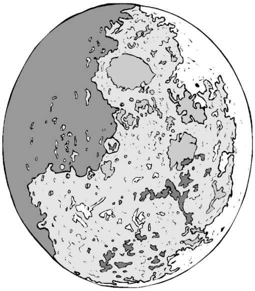
2. Which two planets are closest to the earth?

3. Which planet is closest to the sun?

4. Why don't we call the moon a star?

5. The circle below represents the earth. Draw an

orbit for the moon as you imagine it to be. Indicate the moon as well.

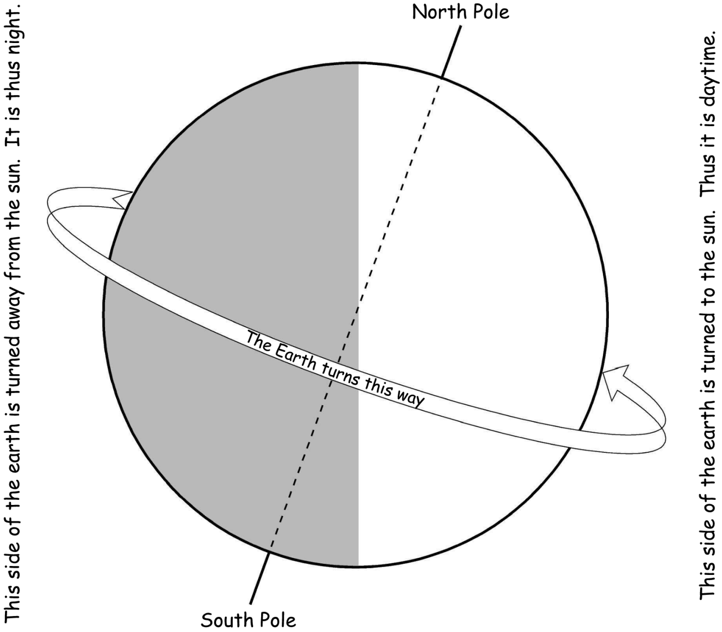


ACTIVITY:

To be able to describe the phenomena of day and night and the changing of the seasons

[LO 1.3, LO 2.2]

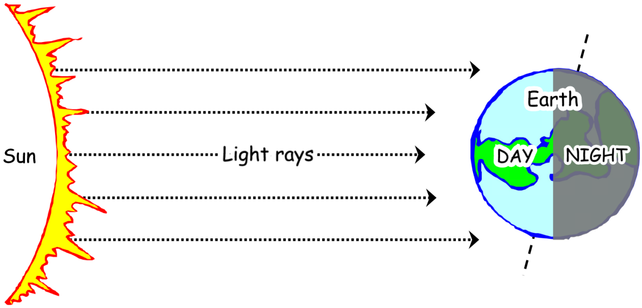
The earth revolves around its own imaginary axis continuously. This imaginary axis lays more or less North-South (from the North Pole to the South Pole). We call this action the **rotation** of the earth.


North Pole
This side of the earth is turned away from the sun. It is thus night.
This side of the earth is turned to the sun. Thus it is daytime.
The Earth turns this way
South Pole

Each rotation of the earth around its own axis takes 24 hours and that is why there is a day and a night in each 24 hours.

Day: the condition on that part of the earth that faces the sun.

Night: the condition on that part of the earth that faces away from the sun.



As the day progresses from early morning until 12 noon, it seems as if the sun is moving upwards in the sky, but of course it is the earth that is moving. In the afternoon it appears as if the sun is going down (setting)

Assessment

LEARNING OTCOMES (LOs)

LO 1

SCIENTIFIC INVESTIGATION

Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

- plans investigations;
- takes the lead in investigating and collecting data;
- evaluates data and communicates findings.

LEARNING OTCOMES (LOs)

LO 2

CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

Learners know, interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

LEARNING OUTCOMES (LOs)

LO 3

SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

3.1 understands science and technology in the context of history and personal knowledge;

3.2 understands the impact of science and technology.

Memorandum

Our Earth: The Living Planet

vity To be able to describe the earth as part of the galaxyLO 2.1	

Allow ample time for informal class discussions on the wonder of everything and our right to wonder about things.

QUESTIONS:

1. Earth orbits another heavenly body, namely the

sun
2. Mars and Venus
3. Mercury
4. The moon does not emit light, it merely reflects the light of the sun
5. Let the learners make an attempt first. Then explain in detail and allow them to try and better their attempts.

An elliptical orbit that is orientated approximately 5 degrees to earth's equator. The moon's diameter is one quarter that of the earth. The distance between the earth and the moon is 30 times the diameter of the earth.

This just for interest's sake:

- lunar diameter 3 476 km
- Earth’s diameter 12 750 km
- distance to moon 384 403 km

Some interesting facts

GENERAL SCIENCE

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 19

Our living earth: Some interesting facts

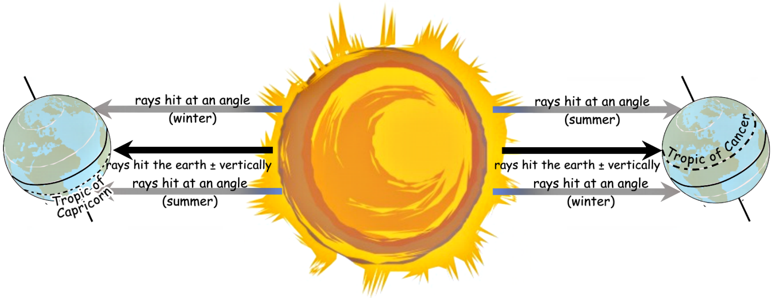
SOME INTERESTING FACTS:

The Tropic of Capricorn and The Tropic of Cancer:

These are two imaginary lines that run parallel to the equator. They indicate where the rays of the sun hit the earth most directly during summer. In the Southern Hemisphere (the Tropic of Capricorn) it happens on 21-22 December and in the Northern Hemisphere (the Tropic of Cancer) on 21-22 June.

Have you ever heard people talking about the longest and the shortest day of the year? Would you be able to explain why we in South Africa have it on 21 or 22 December and 21 or 22 June respectively?

Have you ever seen the sign "Tropic of Capricorn" along one of the roads in the Kruger National Park? Keep your eyes open for it if you ever travel between Letaba and Shingwedzi.



On 20 March and 22 September the sun shines with the same intensity on both the Northern and the Southern Hemisphere. Could you explain that?

Farmers in countries close to the equator are able to plant summer crops throughout the year. Why is that?

For many centuries people believed that the sun orbited the earth. Why, do you think, is it understandable that they held this belief?

People also believed that the earth was flat and that ships would fall over the edge of the horizon if they sailed too far.

ACTIVITY:

To be able to use the sun to tell the time of day

[LO 1.2, LO 1.3, LO 3.1, LO 3.2]

Over the centuries, the sun has meant a lot to mankind. Before there were watches people used, for example, the sun to determine the time.

One method was to see in which direction the shadow of a tree lay, and to look at the length of the shadow.

Another method was to make a sundial.

Work in pairs.

Obtain the following:

a square wood plank (± 15 cm x 15 cm)

setsquare

a piece of cardboard (slightly bigger than the plank)

a pen or pencil

a ruler

a pair of scissors

a protractor

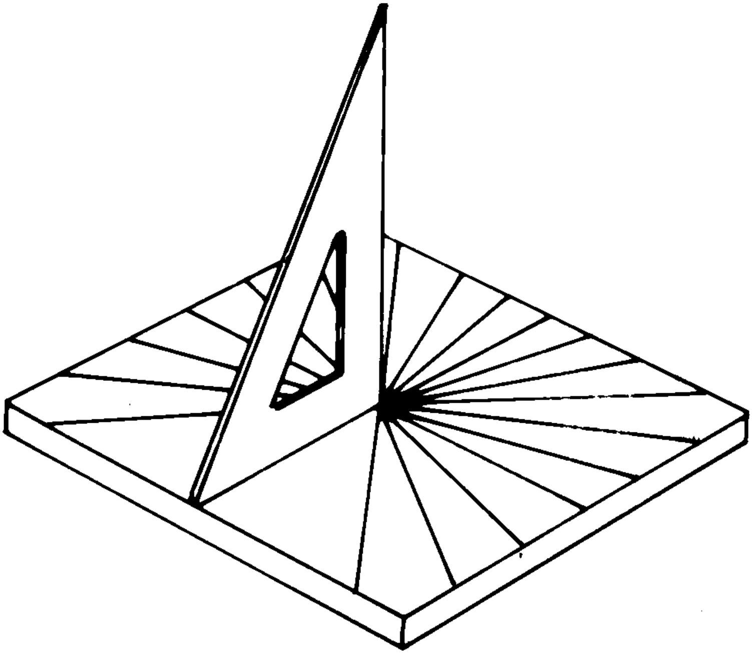
glue

Cut the cardboard as big as the plank and glue it on.

Determine the centre of the cardboard by drawing two lines from corner to corner (diagonally) so that they cross in the middle.

Paste the setsquare on one of the lines as indicated in the sketch.

Place your sundial outside and draw the hour-marks according to the hours on your watch.



1. Explain to the class how the sundial works and why it solved a major problem for humans earlier in history.

2. Why, from man's point of view, is the modern clock (or watch) a great improvement on the sundial?

3. Do some research to determine whether, in early times, people used the sun and moon to determine when to sow vegetables and other crops.

Assessment

LEARNING OUTCOMES (LOs)

LO 1

SCIENTIFIC INVESTIGATION

Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

1.1 plans investigations;

1.2 takes the lead in investigating and collecting data;

1.3 evaluates data and communicates findings.

LEARNING OUTCOMES (LOs)

LO 2

CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

Learners know, interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

LEARNING OUTCOMES (LOs)

LO 3

SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

3.1 understands science and technology in the context of history and personal knowledge;

3.2 understands the impact of science and technology.

Memorandum

1. Class discussion
2. The sundial can be read only when there is a shadow: in other words not at night or on cloudy days. The sundial is not easily portable and has to be set up anew every time.
3. This is a good opportunity to show learners man's past attempts to maintain himself, as well as the value and interesting nature of indigenous knowledge. For instance, our forefathers believed that vegetables that bear their fruit above ground must be sown during the waxing moon phase, and those that bear

their fruit below the ground must be sown during the waning moon phase. The path of the sun (how obliquely it is situated) was an indication of seasons, when the rainy season was near and when to plant crops, etc

Why life on earth is possible

NATURAL SCIENCES

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 20

THE EARTH AS A LIVING PLANET

ACTIVITY 1:

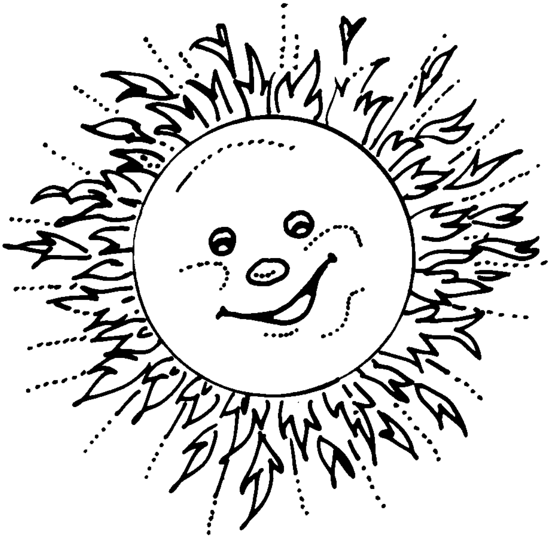
Why life on earth is possible

[LO 2.2]

What makes life on earth possible?

- Let us try to determine which things are necessary for life on earth.

Read the following passage and try to find four things that are necessary for life on earth, as we know it.



Man is used to seeing the sun rise and set every day. But do we always realise how important it is that it does happen? Sunlight contains energy that heats the earth and provides light

.

We must remember that we cannot live on sunlight alone and that we would not have been here if it hadn't been for plants. Plants have the wonderful ability to absorb sunlight and use it to produce food. When we eat the plants, our bodies absorb this food and we can live.

However, plants need more than sunlight to produce food. They have to use their roots to draw the ingredients they need to make the food out of the soil.

Water is a very important ingredient, but there are also other ingredients such as iron and nitrogen that are necessary.

We would not be able to live on food and water alone. We also need oxygen to breathe. This oxygen is found in fresh air and is continuously being replenished by the plants. Plants take in the old air that animals and people have exhaled, and then make oxygen that is released into the air.

Four things are, therefore, essential for life on earth:

, ,

and .

ACTIVITY 2:

To be able to explain why the sun and plants are essential for life on earth

[LO 1.1; LO 1.2; LO 1.3]

Life without ENERGY is impossible.

Think of ten activities that you do every day and for which you need energy, and write them down here.

You get all the energy you need from the food you eat and the liquids you drink. All these foodstuffs originally come from plants. The plants use solar energy to produce it.

Complete the following table by writing down ten examples of food and drinks that you regularly ingest. Next to each one you must indicate from which plant it comes originally. (In some cases the plant was eaten by some other animal first, and then the product materialised, e.g. meat or eggs.)

Example of food or drinks that you ingest regularly		Plant from which the main ingredients originally come

Think of more reasons why the sun is essential for life on earth, and write them down.

Both humans and animals are dependent on plants as a source of food. However, there are other reasons why plants are important. Write down FIVE such reasons.

Do some research on the medicinal value of plants. Include at least two examples of plants of which the medicinal value was discovered in Africa or South

Africa. (Read up in books and magazines and discuss this with your parents or elder brothers or sisters.).

ACTIVITY 3:

To be able to talk about the importance of trees

[LO 1.2; LO 3.1]

Let us focus our attention on trees.

1. When is it national arbour day this year (the date)?

2. Why are we encouraged to plant trees?

3. Why are scholars especially encouraged to plant trees?

4. Write a short poem about a tree.

Plan the poem as a group. The poem can be about a tall tree or about a young tree.

Write the poem in its final form here. Decorate your poem at home. You could also make a poster on which you write the poem and then the group could decorate it.

Assessment

LO 1: SCIENTIFIC INVESTIGATIONLearners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS

we know this when the learner:

1.1 plans investigations;

1.2 takes the lead in investigating and collecting data;

1.3 evaluates data and communicates findings.

LO 2: CONSTRUCTION OF SCIENTIFIC KNOWLEDGELearners know, interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS

we know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

LEARNING OUTCOME 3:

Science, SOCIETY and the environment Learners are able to show understanding of the underlying connections of technology, the community and the environment**.**

ASSESSMENT STANDARDS

We know this when the learner:

3.1 understands science and technology in the context of history and indigenous knowledge:

Memorandum

Activity 1

Sunlight / sun energy, soil / nutrients, water and oxygen (plants will also be mentioned: acknowledge that it is correct, but that we are first discussing the *non-living* things. Use the opportunity to make learners aware of the value of plants and the necessity of conserving them - talk about the indiscriminate destruction of forests/trees, overgrazing, etc.)

ACTIVITY 2

Examples:

- Bread wheat
- Porridge maize/grain
- Sugar sugar cane
- Meat grass/grain
- Egg grain/maize
- Fruit fruit
- Fruit juice fruit
- Imitation soft drink often sugar cane, little or no fruit
- Ice cream grass/grain
- Butter grass/grain

- Milk grass/grain
- Fish algae/aquatic plants
- Use of sun: we would not be able to seewe would have died of cold

energy for work performance comes mainly from the sun (e.g. petrol)

- Plants: shade (prevents overheating of soil)

wood for fires (energy) and building medicine

- Plants as medicine Give a lot of attention to this assignmentTalk about indigenous knowledge: 70 % of South Africans consult traditional healers

Examples of medicinal plants in SA (there are many)

- *Buchu* (*ibuchu, boegoe*): leaves and roots for kidneys and general problems of the excretory system, bruises, rheumatism, chewed for stomach ache
- *Cape aloe* (*ikhala, bitteraalwyn*): leaf sap for conjunctivitis, arthritis, eczema, skin irritations, burns and bruises
- *African wormwood* (*umhlonyane, wildeals*): leaves for tea for upset stomach, ground leaves emit vapours that are inhaled for headache and colds, taken for measles and colds, enemas for constipation, worms
- *Wild willow* (*umngcunube, wilde wilger*): bark for

aspirin

ACTIVITY 3

1. Every year from 1 to 7 September: there is always a week-end in this period.
2. Many reasons, e.g. ozone layer, shade promotes bird and other animal life, good for soil.
3. They invest in their country, they are the next generation that has to take responsibility for the land, they make their parents aware of the importance of trees and environmental conservation and so the message spreads through the community.

How soil is formed

NATURAL SCIENCES

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 21

HOW SOIL IS FORMED

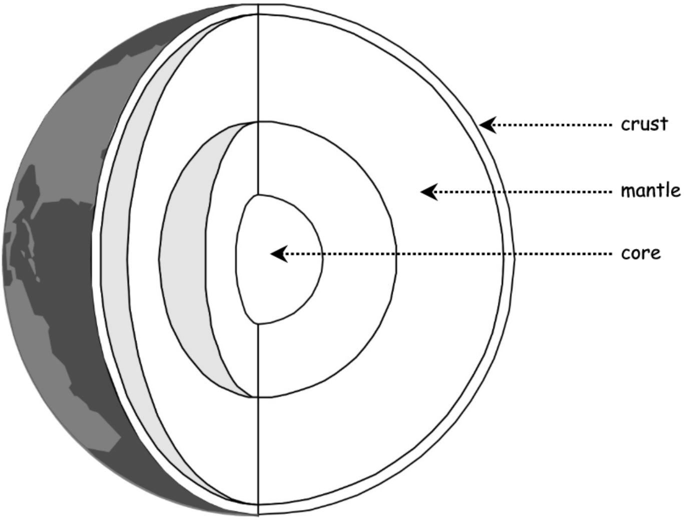
Activity:

To be able to explain how soil is formed

[LO 1.3]

How soil is formed

The earth is made up of three main layers: the crust, the mantle and the core.



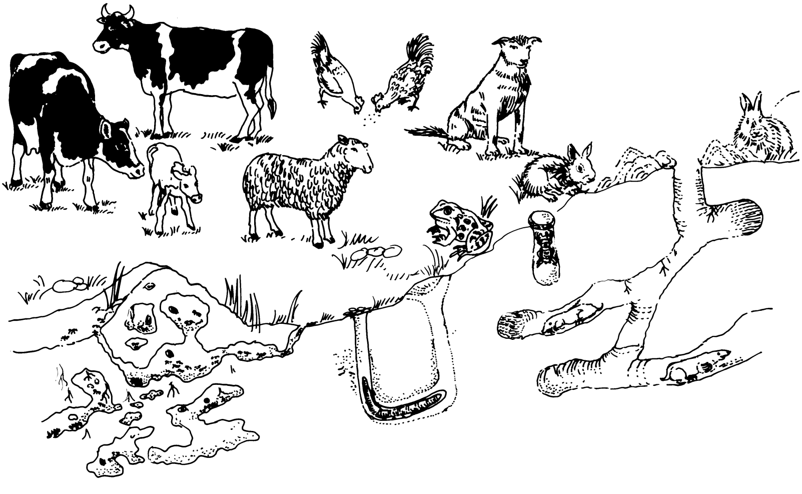
The crust is the thinnest layer and is between 35 and 50 kilometres thick. It consists mainly of solid rock.

The rocks on the surface are constantly breaking up. This forms soil. It happens because the heat of the sun and the cold of the night cause the rocks to crack as a result of expansion and contraction.

The roots of plants cause the rocks to break up further. New plants grow in the crevices. They die and rot, and this decomposed material, together with smaller rock particles, forms soil.

Water (rain, rivers, the sea) causes the rocks to break up further. The water washes the particles away to other places where soil is formed. Many small particles are also spread by the wind.

How is soil utilised by animals?



Complete the table by inserting the names of animals that utilise the ground in some or other way, and explain how they utilise it. Start with the animals in the illustrations above and add some more of your own examples.

Animal	How soil is utilised

What happens to these animals if they die in or on the ground?

Assessment

LO 1: SCIENTIFIC INVESTIGATIONLearners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS

we know this when the learner:

plans investigations;

1.2 takes the lead in investigating and collecting data;

evaluates data and communicates findings.

Memorandum

Table: examples

Earthworm eats rotting material in ground, ground protects against heat and dryness, as well as predators

Ants store food supplies and eggs

Hunting spider tunnel in ground protects against elements and predators

Cock/hen gets food in/on ground, sand helps with grinding of food for digestion

Rabbit protects against predators, place to rear young

Mole finds food in ground (plant roots and insects)

Frogs protects against dryness and cold, survival through unfavourable times

Snakes protection against elements and predators

Wart-hog protection against predators

Animals that die they decompose and their remains become part of the soil, and so fertility of the soil is enhanced

What soil consists of

Natural scienceS

GrADE 5

PLANET Earth AND The UNIVERSE

Module 22

WHAT SOIL CONSISTS OF

Activity 1:

to determine what soil consists of

[LO 1.2; LO 1.3]

What does soil consist of?

Do the following investigation on your own:

Scoop up a handful of garden soil from your garden and place it in a transparent container.

Add water until the container is about three-quarters full.

Seal the container and shake it very well.

Place the container on a windowsill or any other place where you can observe it carefully.

Write down your observations by answering the following questions:

1. How long did it take before the water was relatively clear?

2. Soil forms layers when it settles down. How many layers can you distinguish?

3. The size of the particles in the different layers differs. Which layer looks the coarsest (i.e. has the largest particles)?

4. Which layer appears to be the finest (has the smallest particles)?

5. What is floating on the surface of the water?

6. Does the soil in your friends’ containers look exactly the same as yours? Describe.

ACTIVITY 2: To examine different types of soil and to be able to explain why plants grow best in certain types of soil

[LO 1.2; LO 1.3]

Different types of soil

There are mainly three types of soil: sandy soil, loamy soil and clayey soil.

The soil types differ with regard to their ability to absorb water, to retain water and to let in air.

The following examination will indicate how the three types of soil differ from each other in this regard:

Work in groups of three.

One group member brings clayey soil to school, the other one brings sandy soil and the last one brings loamy soil.

Bring three empty cool drink bottles of the same size. The top half of the bottle must be removed.

Fill each container one-third full of soil. Each container must contain a different kind of soil. Compact the soil.

Place the containers next to each other on a table or on any level surface, and slowly pour 250 ml water into each container.

Note in which one the water is absorbed most rapidly.

Quickly make six little holes of the same size in the bottom of each container and place each container on a glass jug. The glass jugs must be of the same size.

Note into which jug the most water has seeped after a certain time.

Write down your conclusions. Mention all three types of soil.

Make a sketch of your apparatus.

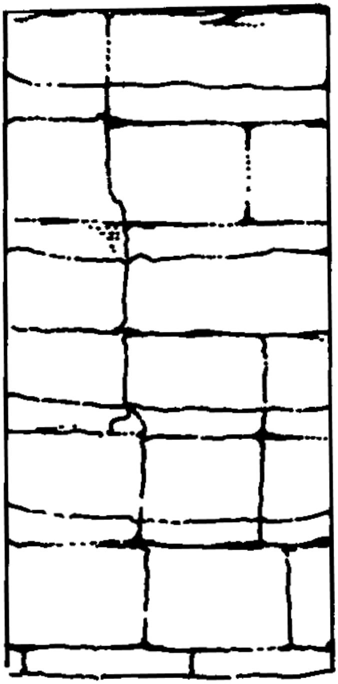
Question: In which type of soil will plants grow best?

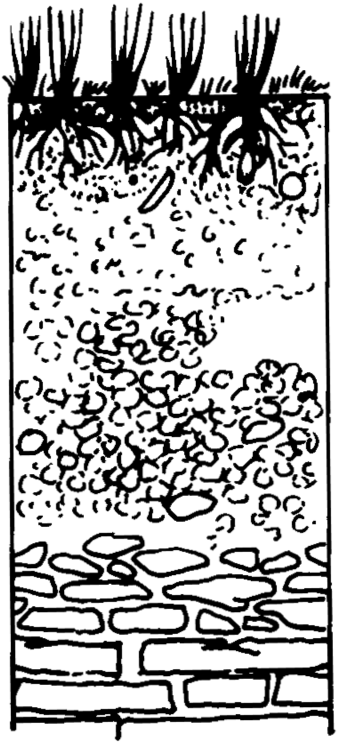
Explain:

Activity 3: To examine how topsoil is formed

[LO 2.2]

Study the sketches below and then answer the questions that follow:





weathering rock

1. Why is the top layer depicted as being dark?

2. Why is the dark layer in the right-hand sketch thicker than the one in the sketch in the centre?

3. How do the plants in the right-hand sketch differ from those in the sketch in the centre? You must also explain why they differ.

Let us apply your answers and reach a few important conclusions:

The top layer of soil differs from the deeper soil because it contains more humus (decayed plant material). We speak of topsoil that is fertile.

There is a cycle: plants make the soil more fertile, and fertile soil makes plants grow better.

The thicker the topsoil, the deeper the plant is able to grow to take up nourishment and water from the soil, and the better able are the roots to anchor the plant in the soil so that it does not wash away when it rains.

If there are no plants, or if the plant roots grow very shallowly, the soil will be washed away easily.

Assessment

LO 1: SCIENTIFIC INVESTIGATIONLearners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

we know this when the learner:

plans investigations;

1.2 takes the lead in investigating and collecting data;

1.3 evaluates data and communicates findings.

LO 2: CONSTRUCTION OF SCIENTIFIC KNOWLEDGELearners know, interpret and apply scientific, technological and environmental knowledge.

we know this when the learner:

2.2 recalls significant information;

2.3 categorises information

Memorandum

Activity 1

This simple experiment is certainly worth doing.

Answers:

from learners' own observations

Question 5: dead plant material

Activity 2

Ensure that the learners all use the same size container. Learners have to answer the questions themselves according to their own observations. Plants grow best in loamy soil, because the soil is loose enough for the roots to grow in , water, organic material and oxygen can penetrate the soil, but the water does not run through immediately. Therefore the nutrients do not wash away and the soil stays moist. The plant is better anchored than in sand.

Activity 3

It contains organic material (especially plant remains)

Plants have grown in it for a longer time

Larger, deeper-reaching roots. Can anchor better and absorb more nutrients and water.

Soil erosion

Natural Sciences

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 23

SOIL EROSION AND GOOD FARMING METHODS

ACTIVITY:

To be able to discuss soil erosion and good farming methods

[LO 1.3; LO 2.1; lo 2.2]

Soil erosion

- Have you ever walked on the beach on a windy day and felt how the grains of sand pelt your legs? It is a regular, natural occurrence that the wind picks up and transfers soil particles, and especially grains of sand, to a different area.

Group assignment

You will need: a square wooden block, a hairdryer, coarse and fine sand and an empty ice tray.

Place a little mound of sand on the wooden block.

Place the block and the ice tray next to each other.

Hold the hairdryer close to the sand and blow the sand into the ice tray.

Write down your observation.

Let's apply what you have just learnt.

- During a dust storm the finest particles of sand are blown through the air at a relatively high altitude, while the coarser particles move at a height of about one metre. This is how dunes on the coast or in the desert are continually on the move. Unfortunately the wind can also cause soil erosion in this way. If overgrazing takes place, or if plants are destroyed or grasslands are burnt indiscriminately at the wrong time of the year, the top layer of soil becomes exposed and the wind can cause erosion.
- Water can cause even more serious soil erosion if, for example, there are not enough plants growing against a steep incline.

Good farming methods

Answer the following questions:

1. Why mustn't natural vegetation simply be destroyed?

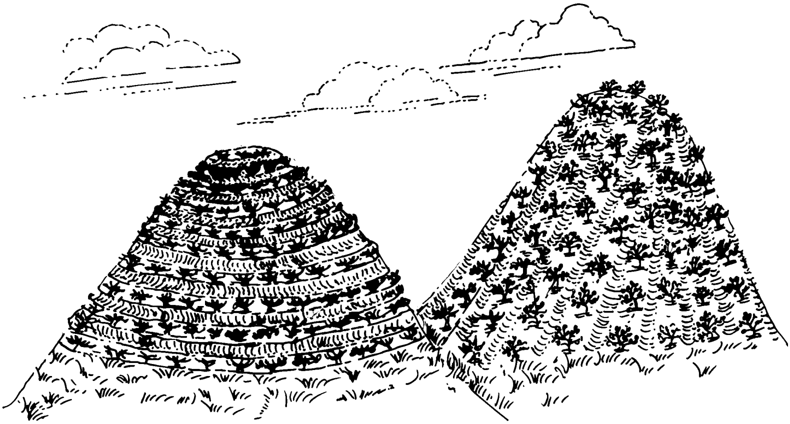
2. Why could footpaths be harmful to the veld?

3. Experienced stock farmers like to make many camps for their stock. They also like to lay on water to each camp.

(a) Why?

(b) In the early years, when farmers did not have the necessary materials to make camps, how did they solve the problems they were faced with?

4. Look at the following sketch. It shows that a farmer who wants to establish a vineyard, an orchard or a maize field on a hilly farm, can prepare the soil in two ways.



Which of the two ways would you recommend, and why?

Assessment

LO 1: SCIENTIFIC INVESTIGATIONLearners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

We know this when the learner:

1.1 plans investigations;

1.2 takes the lead in investigating and collecting data;

1.3 evaluates data and communicates findings.

LO 2: CONSTRUCTION OF SCIENTIFIC KNOWLEDGELearners know, interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information

Memorandum

Farming methods

1. Erosion, balance of oxygen/carbon dioxide

    (composition of air, ozone layer), animals depend on plants as food, for protection, etc.
2. Plants die when trodden on, ground becomes hard, no humus, when it rains heavily the topsoil washes away, erosion begins
3. Reasons for camps

    1. Prevents overgrazing in certain areas and the formation of footpaths as the animals always have to walk to a water source in another place
    2. Migration to parts where water and grazing are available

4. Method of ploughing obliquely against the rise, as it prevents flooding and erosion.

NATURAL SCIIENCES

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 24

THE IMPORTANCE OF WATER

activity:

TO BE ABLE TO EXPLAIN WHY WATER IS

IMPORTANT FOR LIFE ON EARTH, HOW THE PLANET MAINTAINS ITS WATER BALANCE AND WHY SENSIBLE WATER CONSUMPTION IS IMPORTANT

[LO 2.1; LO 3.2]

The importance of water

Without water, life is impossible. Let us examine a few examples that illustrate the importance of water for plants and animals:

- Water makes up about 80% of the body of a land plant, and about 60% of the body of a human. It is this water in the bodies of animals and plants that prevents the temperature of the plant or animal from rising too high when it is hot outside, or from falling too low when it is cold.
- Water evaporation helps plants and animals to cool down their bodies (in the form of perspiration in animals and, in the case of plants, in the form of moisture that is exuded from mainly the leaves).
- The process of exchanging gases when breathing takes place is only possible if the surface is moist.
- Blood flows only because it consists mainly of water.
- The process of conveying nutrients within a

plant would not be possible without water.
- Food digestion is only possible if there is sufficient water.
- Many plants and animals live in water.
- Various animals that live on land can only procreate if there is sufficient water, e.g. the frog.

Earth's water supply

The earth's water supply is never replenished from space, as is the case with solar energy, which we get from the sun.

However, nature has developed mechanisms to maintain the earth's water supply. In this way, for example, water in nature is used over and over and we speak of water cycles.

Unfortunately, humans are inclined to disturb these water cycles with their activities. Examples of this are the way in which huge industries use water, the destruction of indigenous vegetation, pollution and water wastage.

See whether you are able to mention ten examples of water wastage, water pollution or indiscriminate use of water.

THE WATER CYCLE

The largest part of planet Earth is covered by water (70%). That is why Earth looks blue on photos that are taken from satellites.

Besides this visible **surface water** there is also a great deal of **subterranean water**.

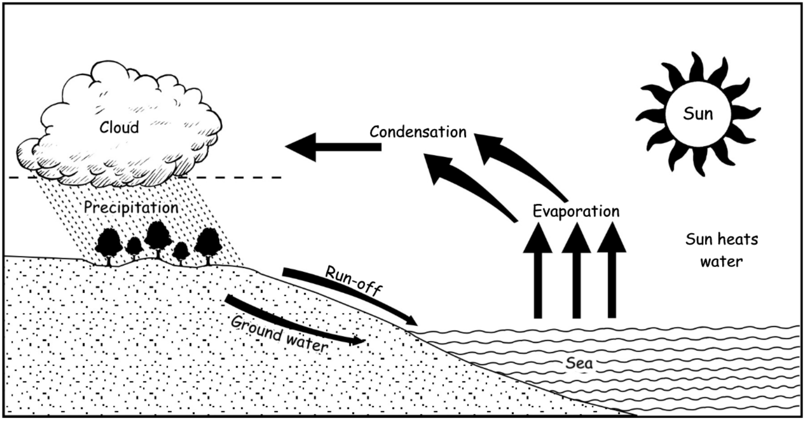
The water is distributed by means of subterranean canals (underground watercourses) and rivers on the earth's surface.

As a result of the warming effect of the sun, this water is not icy cold everywhere.

The warming effect causes a huge amount of water to rise into the air every day as it **evaporates** from dams, rivers, lakes and oceans.

As the vapour rises, it cools down and **condenses** to form droplets of water. This is how clouds are formed.

When conditions are favourable, the water in the clouds falls to earth again in the form of rain. This process repeats itself continuously and we refer to it as the **water cycle**.



1. Describe the water cycle in your own words.

2. What would happen to the water cycle if the heat of the sun were to decrease or if the sun were to stop shining altogether?

3. Explain how rain is formed.

4. Name and explain four ways in which humans disturb the water cycle.

Assessment

LEARNING OUTCOME 2: CONSTRUCTION OF SCIENTIFIC KNOWLEDGE Learners know, interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information

LEARNING OUTCOME 3: Science, SOCIETY and the environment Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS

We know this when the learner:

3.1 understands science and technology in the context of history and indigenous knowledge:

3.1.1 describes traditional shelters and connects some features of such shelters with modern dwellings.

Memorandum

A few examples (there are many: give the learners the opportunity to talk to people at home and to find examples: it creates a consciousness in the community of this problem):

Waste/indiscriminate use

- Pipes and taps that leak
- Taps that are not closed properly
- Trees are planted in areas that have ample water (especially plantations)

- Alien plants are allowed to intrude and encroach on indigenous ones
- No dams are being built

Pollution

- Insufficient sanitation
- Rubble
- Industrial waste
- Alien plants are allowed to grow in water (drive indigenous plants out, upset the balance, plants and animals die, sediment and decomposition removes oxygen from the water)
- Vehicle exhaust fumes contribute to the occurrence of acid rain

Water cycle

- Description must contain the following: evaporation, cloud formation, types of precipitation, e.g. rain, underground water, rivers, dams, lakes and oceans
- Evaporation would stop and the water would just stay where it is
- Evaporation, cooling, condensation, and cloud formation

4. Destruction of indigenous vegetation

Large-scale overgrazing (desert forming)

Indiscriminate change of the natural flow of water

Destruction of the ozone layer, pollution: global warming, warming of the oceans, rainfall patterns disturbed

Indiscriminate establishing of plantations (in areas with plentiful water)

The atmosphere

NATURAL SCIENCES

Grade 5

PLANET EARTH AND THE UNIVERSE

Module 25

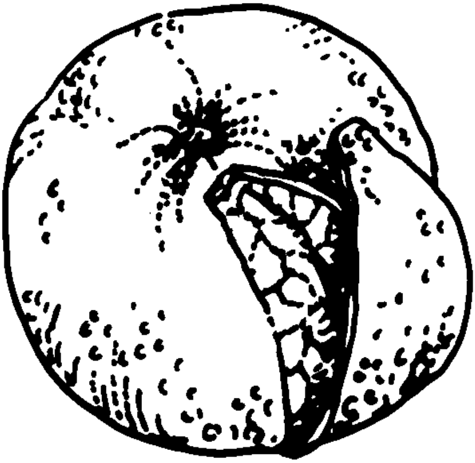
THE ATMOSPHERE

ACTIVITY:

To be able to explain why the earth’s atmosphere makes life possible and why we must maintain it.

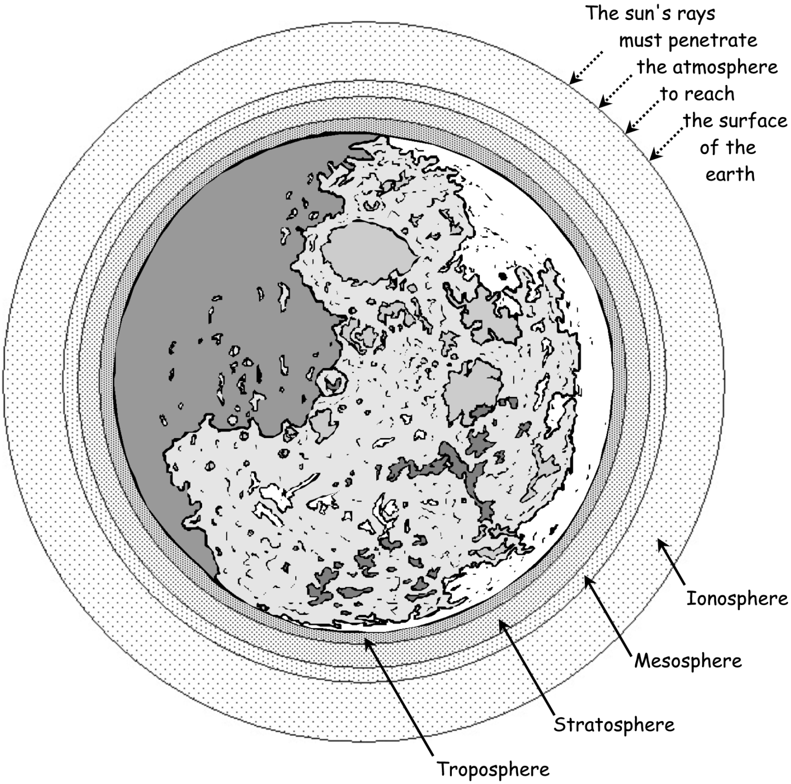
[LO 2.1; LO 2.2]

The planet Earth is covered by a thick “blanket” of gases that is called the atmosphere. The thickness of the layer (atmosphere) in relation to the size of the earth can be compared to the thickness of the peel of an orange in relation to the size of the orange.



Life on earth would not be possible without the atmosphere. The atmosphere does not only consist of gases that are essential for life, but it also prevents us from being ‘roasted’ by the sun and from being frozen to death by the extreme cold of outer space. The atmosphere allows only half of the rays of the sun to reach the earth’s surface.

The atmosphere has four layers .

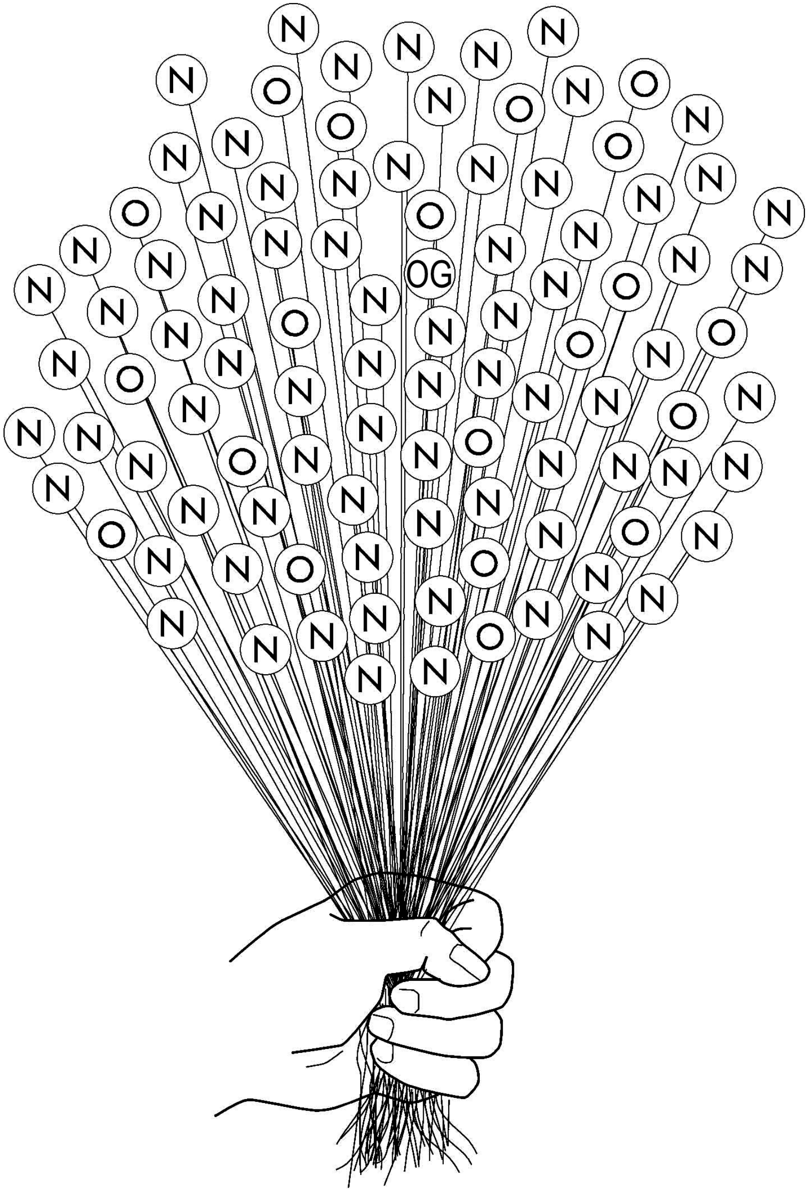

The sun's rays must penetrate the atmosphere to reach the surface of the earth
Ionosphere
Mesosphere
Stratosphere
Troposphere

Layer 1: The Troposphere

This is the layer that is right against the surface of the earth. It is about 11 km thick and it is in this layer that weather changes take place in the air. It is practically only in this layer that water is found.

The air in the troposphere consists mainly of two gases: nitrogen and oxygen. There is a very small amount of other gases.

You can illustrate the composition of the air with balloons:



Count the balloons and write down the numbers:

Those with an N (that is for nitrogen):

Those with an O (that is for oxygen):

Those with an OG (that is for other gases):

Now describe in your own words how the air is composed in the troposphere (the air that we breathe):

The higher one moves up into the troposphere, the “thinner” the air gets. That means that the particles are spread out so that they are further away from each other. For example, if you were to fill a container with air at an altitude of 8 km, there would be fewer particles (nitrogen, oxygen and other gases) in the container than if you were to fill the container on ground level.

Layer 2: The Stratosphere

The stratosphere is approximately 40 km thick. Aircraft fly in this layer. The very important ozone layer is found in the stratosphere. The ozone layer is a kind of oxygen layer that protects the earth against the harmful rays of the sun. Without this layer most living creatures on earth would die. The oxygen in the ozone layer comes from the plants that grow on earth. If this balance were to be disturbed because less oxygen were to reach the ozone layer and its place were to be taken up by other gases that are released by certain human activities, it would alter the temperature on earth. That could ultimately mean that both animal and plant life would become impossible. Plants and animals would be wiped out.

Layer 3: the mesosphere

This layer is approximately 40 km thick and is characterised by fluctuations in temperature between -113° Celsius and 440° Celsius. (One's body temperature is 37° Celsius, water freezes at approximately 0° Celsius and boils at approximately 100° Celsius.) Rocks that fall from outer space are incinerated in this layer and we see them as "falling stars".

Layer 4: The Ionosphere (thermosphere)

The ionosphere layer is about 350 km thick and contains many charged particles (ions). They deactivate a great deal of the radioactivity that is caused by the sun at certain times, so that it does not have any effect on the earth.

Questions:

1. Why is it always important that we plant more plants instead of destroying them?

2. Industrial progress can be harmful to nature because it can change the atmosphere. Explain why.

3. Why do mountaineers who climb high mountains such as Everest, wear oxygen masks?

Assessment

LEARNING OUTCOME 2: CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

Learners know, interpret and apply scientific, technological and environmental knowledge.

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

Memorandum

Number of balloons (but let the learners count first):

N 79

O 20

OG 1

Composition: In every 100 parts there are 79 parts nitrogen (79 %), 20 parts oxygen (20 %) and one part other gases (1 %)

Answers:

N.B.: These questions must be answered with specific reference to the atmosphere.

1. Plants emit oxygen and water vapour and absorb carbon dioxide. Thus they contribute to the maintenance of the necessary balance in the troposphere and stratosphere (including the ozone)
2. Anything that refers to the ozone layer

3. The pressure becomes so low that there is too little oxygen per volume unit.

Materials for traditional houses

GENERAL SCIENCE

Grade 5

QUALITIES AND USES OF MATERIALS

Module 29

THE PROPERTIES OF MATERIALS

ACTIVITY:

To investigate the properties of certain materials

[LO1.1.3, LO 1.2, LO 1.3]

1. Polymers

One gets natural and artificial polymers. Proteins, which any living body needs to grow, are an example of a natural polymer. Synthetic polymers were first invented about 100 years ago. They were very scarce and expensive then. Synthetic polymers can be divided into two groups: fibres and plastic. We are going to look mainly at plastic.

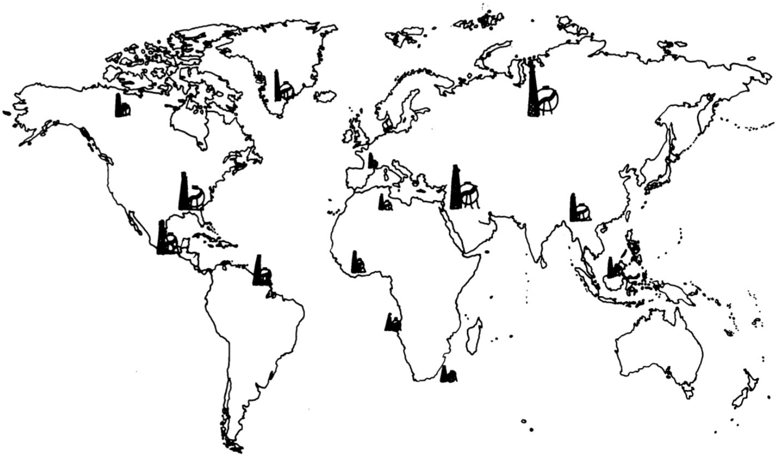
Synthetic Polymer: Plastic

Plastic can be clear or coloured and can be made into any shape.

How is plastic made?

Oil is found deep under the ground in certain places. People drill into the ground and pump the oil to the surface. This oil is thick and is called crude oil.

Look at the map below and identify the countries where oil is found. You can do this in your group.



Experiment: from oil to plastic

Let’s do a simple experiment to see what processes crude oil goes through to make plastic.

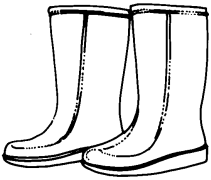
- Heat butter
- Butter melts
- Butter divides into two parts: One is light and white in colour and the other is heavy and yellow

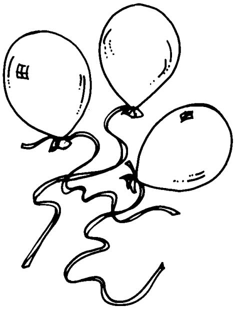
When crude oil is heated more or less the same happens. The crude oil is taken to a refinery where it is heated to a very high temperature. The crude oil divides into darker and lighter oils. The light-coloured oil is used to manufacture plastic and some other substances.

Use of plastic

Certain plastics are hard and are used to make tables, chairs, and parts for motorcars that used to be made from steel. Plastic can be much harder than steel.

Other plastics are soft and flexible. These plastics are used to make things like shopping bags, shower curtains and raincoats.





Plastic is used to make containers for storing food. Many items on the shelves in supermarkets are stored in plastic containers.

Name some foods sold in plastic containers.

What role does plastic play in housing?

In informal settlements plastic is an important material used in the construction of shacks. Have you seen how plastic is used and do you know why plastic is such and important material? How can plastic protect the shack from various weather conditions?

How is plastic recycled and how is it used again? Look for information and give feedback.

Remember: Plastic can and should be recycled.

I nteresting facts:

Plastic can be ten times harder than steel and can withstand high temperatures.

Credit cards are made of plastic and used instead of cash.

Surgeons use plastic to replace various body parts, e.g. heart valves, arteries, etc.

Advantages of plastic:

The use of plastic has created many jobs for people in South Africa.

Nature cannot produce enough cotton, wool wood, etc., so we have to use other materials such as plastic.

Disadvantages of plastic:

We throw away heaps of plastic every day. Animals and plants decompose, but not plastic.

Plastic causes the death of many animals, especially fish, which are strangled by plastic ropes.

Let's look at some other synthetic polymers. (This section is just for information)

Fibre

Fibre is a term used to describe a long, thin thread of material. There are many sources for fibres. Some are from plants like cotton, paper and coir. Others come from animals, e.g. wool. Nylon and rayon are manmade fibres.

The human body contains a number of fibres, e.g. hair and nails. Each hair is actually a string of proteins called keratin. The hair is in the form of spirals. This makes the hair strong and elastic. Wet hair stretches but goes back to its original length when it dries.

Silk

Silk is a natural fibre. Many animals make silk. The most common one is a spider, but silk worms are farmed for their silk.

The caterpillar of the silkworm moth makes silk.

Glass

There are many kinds of glass. The most common is the kind used for windows.

Properties of glass

- Do you remember that a liquid can be solid (ice) or liquid (water)? Glass is a unique substance that can be either a liquid or a solid. Glass can be like a solid because it is hard and brittle, but it also has many of the properties of a liquid.

How is glass made?

- Glass is made by mixing sand, limestone and soda ash. Sometimes broken glass is added to the mixture.

Glass is a stable substance and has important properties that make it very versatile – it can be used for many different things.

Glass does not weather.

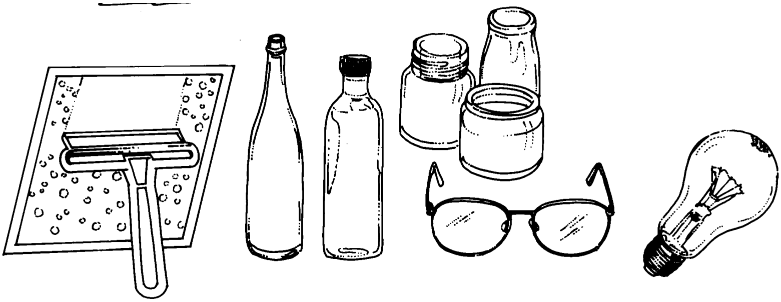
Glass will not dissolve in water or most chemicals.

Glass can be used as containers for most foods and drinks.

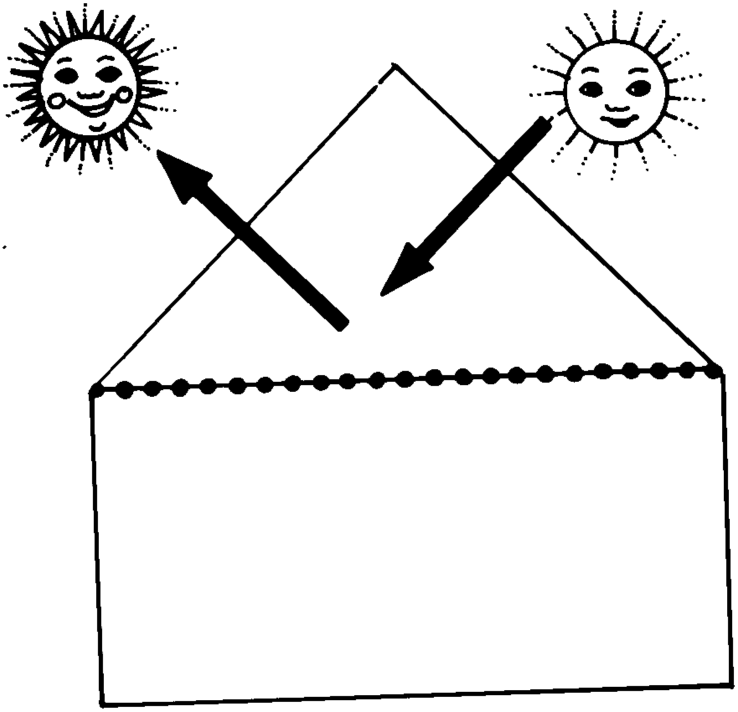
Glass is transparent. Light can shine right through it.

Glass has a smooth hard surface that is hygienic and is easily cleaned for storing foodstuffs.

Glass can break easily but is also flexible if stretched into long fibres. These fibres are very strong and can be used to make many things, e.g. a canoe or a surfboard.



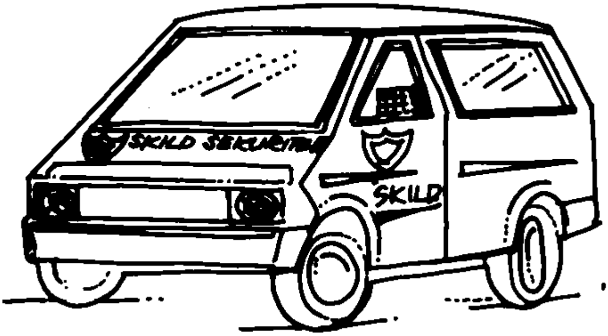
Layers of glass fibre can be put between the ceiling and the roof of a house to serve as insulation. What does this mean?



On a warm day it keeps out heat and so the house is cooler. On a cold day it keeps the heat in and the house is warmer.

Changing the composition of the mixture can change the properties of glass.

Special types of glass can be made, e.g. *safety glass* is used for car windows. When this glass breaks it crumbles into pieces that is held together by plastic (see sketch).



This is how a car window is made.

Glass Plastic Glass

Does the windscreen stay in one piece even if it has broken?

Why is this important?

Can you think of other places where glass plays an important role?

Interesting facts:

Nowadays we use windows in our houses. Before people knew about glass there were just holes in walls to let the light in. Houses were very dark inside. The Romans were the first to use glass for windows, but it was only in the 19th century that most people could afford to have glass in their windows.

Modern houses have larger windows and even glass doors to give homes a warmer feeling.

Assessment

LEARNING OTCOMES (LOs)

LO 1

SCIENTIFIC INVESTIGATION

Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

- plans investigations;
- takes the lead in investigating and collecting data;
- evaluates data and communicates findings.

LEARNING OTCOMES (LOs)

LO 2

CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

Learners know, interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

LEARNING OUTCOMES (LOs)

LO 3

SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

3.1 understands science and technology in the context of history and personal knowledge;

3.2 understands the impact of science and technology.

LEARNING OTCOMES (LOs)

LO 1

SCIENTIFIC INVESTIGATION

Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

- 1.1 plans investigations;
- 1.2 takes the lead in investigating and collecting data;
- 1.3 evaluates data and communicates findings.

LEARNING OTCOMES (LOs)

LO 2

CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

Learners know, interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

LEARNING OUTCOMES (LOs)

LO 3

SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

3.1 understands science and technology in the context of history and personal knowledge;

3.2 understands the impact of science and technology.

Memorandum

Dictionary work

- Ten thousands: multitude, many

- Unemployed: without work
- Accommodation: place to live
- Refuge: shelter
- Structure: building method, composition, combination
- Shelter: protection
- At present: now

Compare normal houses to squatters’ huts

- Conclusions

- Strongest: House

Why

A house has sturdy foundations of cement and bricks. The walls are of cement, bricks and steel. The roof has a wooden frame with heavy tiles / asbestos sheets. Windows have sturdy frames with glass panes.

Surroundings of squatters’ huts

Yes – where houses aren’t usually built, Tends to be wet in the rainy season; sometimes close to water to use the resource – if heavy rains fall then there are floods. Sometimes sandy where nothing grows. Near to industrial areas – perhaps close to work.

Oil producing countries:

- Canada
- USASouth America
- China
- Middle East
- Russia / former Soviet Union

Plastic containers:

- Ice cream; toothpaste; cleaning agents; juice; shampoo

Plastic in housing:

- Plastic can be fastened over the roof to keep out the rain.
- It can be put around the structure of the house or inside against the walls.
- It can be put on the floor to keep out the damp.

Recycling of plastic:

Learners’ feed back should be mainly about non-soluble plastic that causes pollution in nature.

- It can be burnt to provide energy and heat.
- It can be melted and used again.
- Causes the death of aquatic animals – fish are entangled.
- Animals (e.g. ostriches) swallow plastic.

Car window with plastic

- To protect the occupants from being cut.
- The plastic layer keeps the glass together even though the glass has crumbled.

Reinforced glass:

- The side windows crumble and protect the occupants against cuts.

Oven dishes; in hospitals – thermometer – can be sterilised – clean; glass fibre boats; vehicle windows (reinforced glass) church windows; window panes; glass fibre in the roofs of houses; vehicle lights; etc.

natural materials

NATURAL SCIENCES

Grade 5

QUALITIES AND USES OF MATERIALS

Module 28

NATURAL MATERIALS

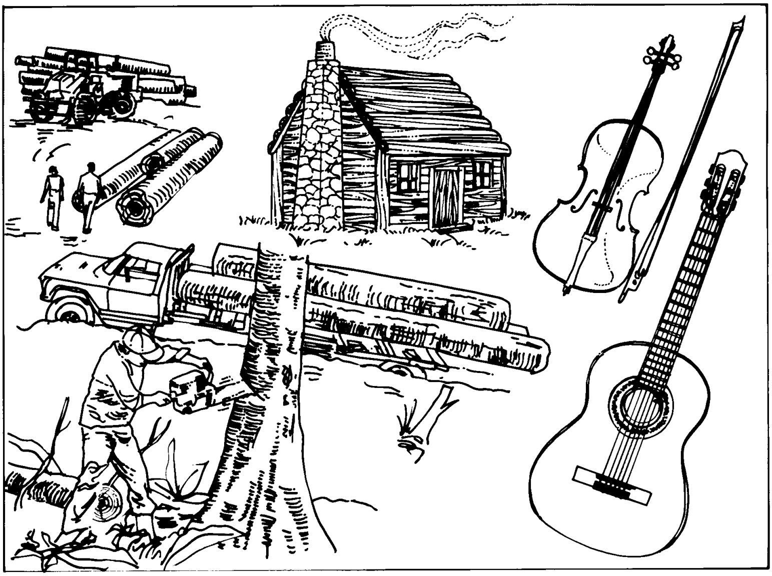
Activity: To discuss the nature and uses of natural materials

[LO 1.1, LO 1.2.1, LO 1.2.2, LO 1.3.1, LO 3.2]

1.Wood

Wood comes from trees that grow all over the world either in natural forests or in plantations that are planted by man.

When trees are fully-grown, especially in plantations, they are chopped down. The branches and the trunks of weak trees are used to make pulp that is used to make paper. The tree trunks are taken to saw mills where they are cut into planks. The wood is then called timber.



Wood can be used for many things, for example, furniture, doors, boxes and toys. Musical instruments like the guitar and the violin are made of wood.

The pulping of wood happens in factories. The wood pulp is mixed with chemicals and water and then rolled out into thin sheets and dried to make paper.

Other uses of wood

Look at your pencil and pencil crayons. What are they made of?

Scrap planks are often used in informal settlements to build shelters and this is better than having no shelter at all.

In tropical countries where it rains a lot wooden houses are often built on poles so that the inhabitants stay dry during the rainy season and also so that unwelcome guests like snakes are kept out.

If wood is looked after properly it will withstand different weather conditions and will protect the inhabitants against heat and cold.

Research: Group work

Make a poster containing the following information.

How wood is used in the building industry.

OR

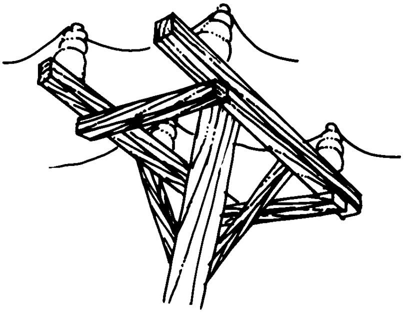
Products made from wood.

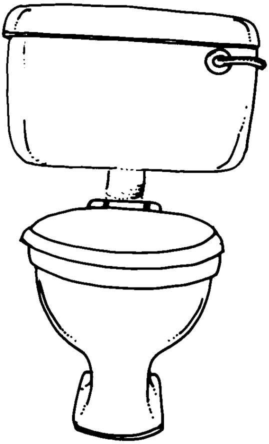
Pictures and drawings that illustrate your project will count in your favour.

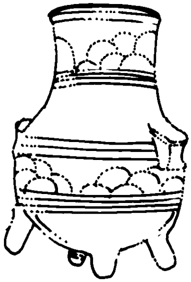
2.Ceramics and Clay

There is a lot of clay available in the crust of the earth. There are different types of clay. Ceramics are made by baking clay. Different types of clay make different kinds of ceramics.

See which items are made from ceramics.



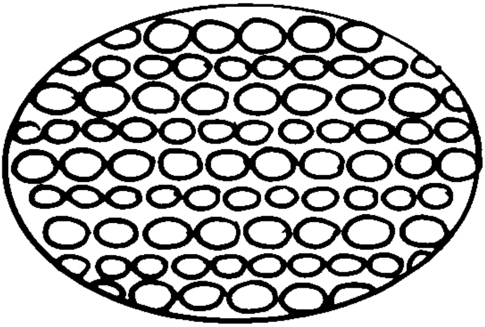




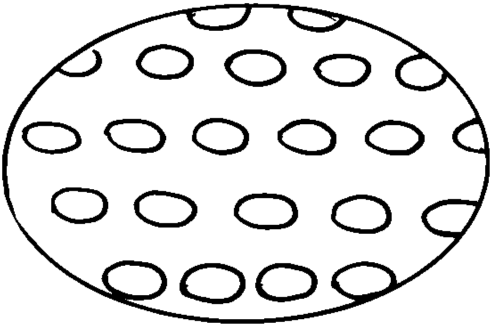
Ceramics is used to make electrical isolators. It prevents electricity from flowing into steel poles or frames.

Let’s see how a ceramic pot is made from clay.

1. Clay that is moist can be easily moulded into a shape. This is the composition of wet clay:



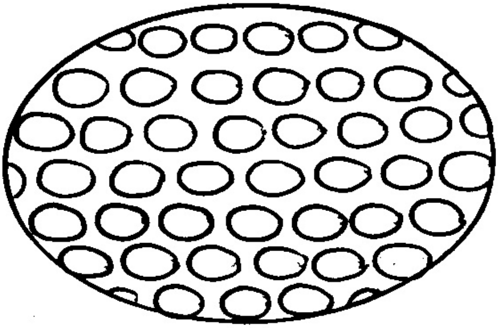
2. Once a clay pot has been made it is left at room temperature to become dry. The water molecules in the clay evaporate and the clay shrinks and gets hard.



This is how the dry clay is composed.

3. When the clay is dry it is baked (fired) in a pottery kiln (pottery at ± 980°C and ceramics at between 1 200°C and 1 700°C).

This is how the clay is composed now.



There is too little space between the clay molecules to allow water through.

Task:

Look at the ceramic vase with flowers and explain the following:

1. How do the flowers stay fresh?

1. Why doesn't the pot leak?

1. Do you think liquids can be stored in ceramic containers?

1. Give some examples of where ceramics are used every day.

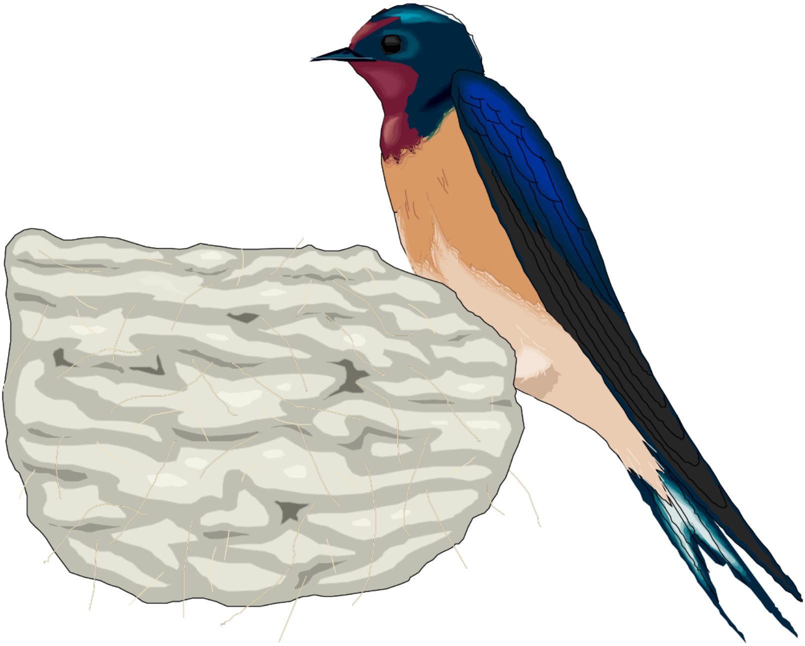
1. What did people use clay for long ago?

Homes of clay: people and animals

- Termites build heaps or nests which can stand out a few meters above the ground. The hot tropical sun bakes the clay till it is hard.
- In Africa, Central America and in the southern states of the United States of America houses are still built from clay. Clay bricks and wood

form the structure of the house. Then more clay is put onto the framework and left to bake in the sun. Clay houses can save between 30% and 40% of energy in areas where the days are hot and the nights cold. The clay absorbs heat during the day and releases it during the night, keeping a comfortable temperature in the house.

- Some birds use clay to make their nests.



Task:

Find information and report in writing about a bird that uses clay to build its nest.

1. Type of bird:

2. In what country are these birds found?

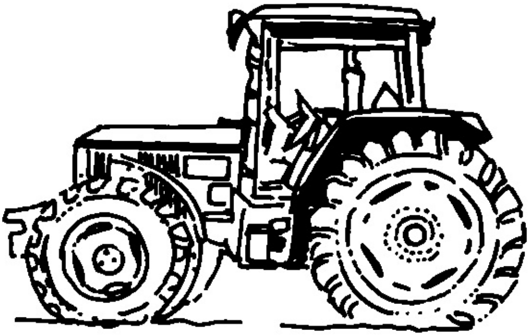
3. Where does the bird build its nest?

1. Make a simple sketch of the bird and its nest

1. What advantage does a clay nest have?

Total: 10

3. Metals



Of all the materials used to make things metal is one of the most important. There are certain jobs that can only be done by using metal. Let’s see how your life depends on metals from morning till night. Just think of transport and farming. The first metal items existed as long ago as 9500 BC: gold; silver; copper and iron.

Metals can be recognised from their appearance:

Metal is usually shiny.

Metals are good conductors of heat and electricity.

Many are suitable for making sounds. When you hit metal, it rings. Church bells are made of bronze.

Metal can be moulded into shapes. Lead is a soft, flexible metal. Sheets of lead used to be used on roofs, especially of churches and schools.

Steel is a mixture of iron and other ingredients. Coins are also made of a mixture of metals.

Interesting facts:

The bottom of a cooking pot must be a good conductor of heat.

Not all metals are suitable for cooking foods in.

Cast iron, stainless steel, aluminium, steel and copper are used to manufacture cooking pots.

When steel is left in the rain it rusts. Water and oxygen in the air have an effect on the iron in the steel and combine to form a new material, namely rust.

Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena and to investigate relationships and solve problems in scientific, technological and environmental contexts.

We know this when the learner:

1.1 plans investigations: lists knowledge concerning familiar situations and materials and compiles inquiring questions together with fellow learners:

1.1.1 contributes interesting aspects to the situation;

1.1.3 responds to teacher’s suggestions of ‘what would happen if …?’

1.2 conducts investigations and collects data: follows instructions and procedures comprising smaller sections:

1.2.1 follows instructions for setting up apparatus and executing observations;

1.2.2 collects data from observation by means of sketches and labels;

1.3 evaluates data and communicates findings: provides feedback on progress in group context, as well as the eventual result:

- presents data obtained from observation that are relevant to the target question;

describes before-and-after situations when they varied some factor in the situation

LEARNING OUTCOME 3: Science, SOCIETY and the environment Learners are able to show understanding of the underlying connections of technology, the community and the environment**.**

We know this when the learner:

3.1 understands science and technology in the context of history and indigenous knowledge:

3.2 understands the impact of science and technology: identifies the positive and negative effects of scientific developments or technological products

Memorandum

Assignment 1:

Questions:

1. The pot can hold water.
2. The space between the clay particles is now so small because it has been baked dry and water cannot pass through.
3. Yes
4. Dishes for ovens

Flower pots

Garden pots

Crockery – plates, cups, etc.

1. To build houses

To make clay pots for water etc.

Assignment 2:

Research: bird, e.g. swallows (see assessment rubric)

Rust: water + oxygen = rust

Materials of the distant past

NATURAL SCIENCES

Grade 5

QUALITIES AND USES OF MATERIALS

Module 20

QUALITIES AND USES OF MATERIALS IN THE DISTANT PAST

ACTIVITY:

To investigate the use of materials for building traditional South African houses [LO 3.1]

One of the first human ancestors, Homo erectus, was smaller and weaker than the wild animals in his environment and took refuge in groups in caves.

Dictionary Work:

Look up the meanings of the following words and write them down.

Ancestor:

Traditional:

Environment:

The San and the Khoisan:

The San group lived together in groups as hunters and followed herds of game. They lived in caves and temporary shelters made of grass and branches.

The Khoi Khoi had cattle and did not move around as much as the San. Their huts had a framework of bent poles covered by reed mats. Huts like this are still to be seen in Namaqualand today.

The Zulus and Swazis:

The Zulus and the Swazis build either a domed hut or a rondavel hut. The floor of the hut is made from earth and ant heaps that have been crushed into fine grains by the women. Cattle manure and water are spread on the floor to make it stronger. There are no windows and just one door opening.

The domed huts are made from branches and grass. The rondavel wall has a framework of sticks that is filled with clay. The roof is made of poles and sticks covered by thatch.

ACTIVITY:To investigate the influence of other countries in the use of other materials and building styles [LO 3.1]

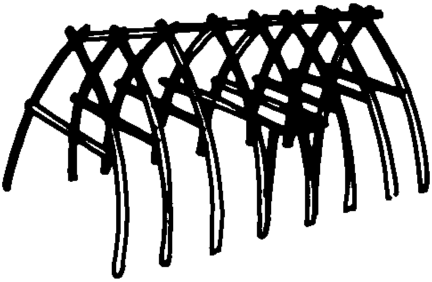
The first houses at the Cape:

The Castle of Good Hope in Cape Town was built from clay and stones. The houses of Jan van Riebeeck’s time had sturdy walls of clay or rough stone. The walls were plastered with clay made from seashells. The roofs were covered with reeds.

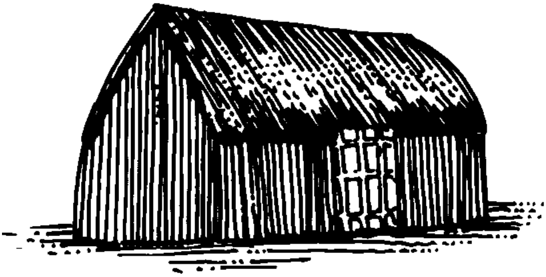
Seashells contain lime, which is almost like cement.

Farmers’ Houses

Trek Farmers lived in simple thatched houses. Young trees were planted in two parallel rows and the tops bent to meet. The walls were constructed from stiff reeds or rushes and were called a "hartbeeshuisie".



Framework of a "hartbeeshuis"



"Hartbeeshuis"

When the British occupied the Cape they had a definite influence on the building style. Local stone, wood, thatch and tiles were used. Later enamel tiles, chrome and bronze were used for decorations.

Questions:

1. What do you think is meant by 'rough stone'?

2. What kind of house was called a “hartbeeshuisie”?

3. Who influenced the building style of the Trek Farmers?

4. Why did the Trek Farmers build their houses the way they did?

5. Why was clay used a lot in the building of houses?

6. Why were reeds often used?

Let’s summarise:

You have learnt about the early building styles and materials used in South Africa. Use this information to make a list of materials that were used and what they were used for.

Practical Work: Let’s build a house.

Work in groups. Decide what sort of house you want to build, either one from long ago or a modern one.

You may use only available materials or waste material, for example, empty boxes, sticks, reeds, matches, clay, etc.

Use the information given to you in this module. You are welcome to use other sources, such as the library or the Internet.

Make a drawing of the house with labels.

Learning Outcomes(LOs)

LEARNING OUTCOMES (LOs)

LO 3

SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

3.1 understands science and technology in the context of history and personal knowledge;

Memorandum

Qualities and uses of materials in the distant past

Dictionary work:

- cruel: inhuman, merciless, stubborn
- traditional: conventional
- housing: provision of shelter

LO 3.1 Questions:

1. rough stone: unhewed stone found in the surroundings

2. hartbeeshouse: firm reeds or rushes

   1. British
   2. because they did not stay in one place. They had to be able to dismantle their houses and convey them elsewhere to re-erect.
   3. Clay was readily obtainable in the surroundings (ground).

6. Reed could be obtained in the marshes. They were light and could keep the house dry and cool in warm weather.

Let's summarise:

Branches, grass, rough stone. Firm rushes, flexible poles, reed mats, sea shells, earth, ant heaps, young trees, water, clay, reeds, stone, thatch, tiles, wood, bronze, chrome, enamelled tiles

Let's build a house:

- Award a mark out of five: Did everyone contribute / Perhaps individuals can get a higher mark if they have made a greater contribution.
- Did the learners use only available material?
- Presentation and effort
- Actual model (group work) – here assessment can be according to participation.
- Does the task consist of:
- 1. Past or present 2. Waste / available materials 3. Worked well together
- Mark out of 5 is code / give average code
- Total out of 25 times 4 = ___ %

GENERAL SCIENCE

Grade 5

QUALITIES AND USES OF MATERIALS

Module 29

THE PROPERTIES OF MATERIALS

ACTIVITY:

To investigate the properties of certain materials

[LO1.1.3, LO 1.2, LO 1.3]

Polymers

One gets natural and artificial polymers. Proteins, which any living body needs to grow, are an example of a natural polymer. Synthetic polymers were first invented about 100 years ago. They were very scarce and expensive then. Synthetic polymers can be divided into two groups: fibres and plastic. We are going to look mainly at plastic.

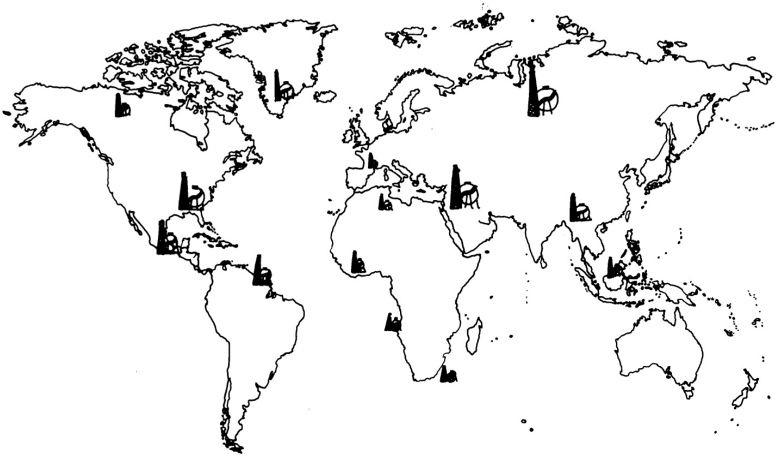
Synthetic Polymer: Plastic

Plastic can be clear or coloured and can be made into any shape.

How is plastic made?

Oil is found deep under the ground in certain places. People drill into the ground and pump the oil to the surface. This oil is thick and is called crude oil.

Look at the map below and identify the countries where oil is found. You can do this in your group.



Experiment: from oil to plastic

Let’s do a simple experiment to see what processes crude oil goes through to make plastic.

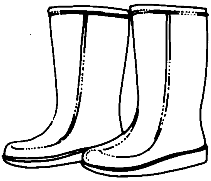
- Heat butter
- Butter melts
- Butter divides into two parts: One is light and white in colour and the other is heavy and yellow

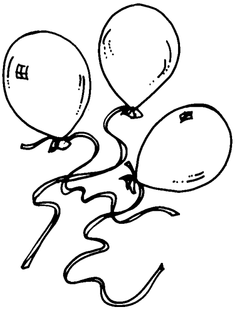
When crude oil is heated more or less the same happens. The crude oil is taken to a refinery where it is heated to a very high temperature. The crude oil divides into darker and lighter oils. The light-coloured oil is used to manufacture plastic and some other substances.

Use of plastic

Certain plastics are hard and are used to make tables, chairs, and parts for motorcars that used to be made from steel. Plastic can be much harder than steel.

Other plastics are soft and flexible. These plastics are used to make things like shopping bags, shower curtains and raincoats.





Plastic is used to make containers for storing food. Many items on the shelves in supermarkets are stored in plastic containers.

Name some foods sold in plastic containers.

What role does plastic play in housing?

In informal settlements plastic is an important material used in the construction of shacks. Have you seen how plastic is used and do you know why plastic is such and important material? How can plastic protect the shack from various weather conditions?

How is plastic recycled and how is it used again? Look for information and give feedback.

Remember: Plastic can and should be recycled.

Interesting facts:

Plastic can be ten times harder than steel and can withstand high temperatures.

Credit cards are made of plastic and used instead of cash.

Surgeons use plastic to replace various body parts, e.g. heart valves, arteries, etc.

Advantages of plastic:

The use of plastic has created many jobs for people in South Africa.

Nature cannot produce enough cotton, wool wood, etc., so we have to use other materials such as plastic.

Disadvantages of plastic:

We throw away heaps of plastic every day. Animals and plants decompose, but not plastic.

Plastic causes the death of many animals, especially fish, which are strangled by plastic ropes.

Let's look at some other synthetic polymers. (This section is just for information)

FIBRE

Fibre is a term used to describe a long, thin thread of material. There are many sources for fibres. Some are from plants like cotton, paper and coir. Others come from animals, e.g. wool. Nylon and rayon are manmade fibres.

The human body contains a number of fibres, e.g. hair and nails. Each hair is actually a string of proteins called keratin. The hair is in the form of spirals. This makes the hair strong and elastic. Wet hair stretches but goes back to its original length when it dries.

SILK

Silk is a natural fibre. Many animals make silk. The most common one is a spider, but silk worms are farmed for their silk.

The caterpillar of the silkworm moth makes silk.

GLASS

There are many kinds of glass. The most common is the kind used for windows.

Properties of glass

- Do you remember that a liquid can be solid (ice) or liquid (water)? Glass is a unique substance that can be either a liquid or a solid. Glass can be like a solid because it is hard and brittle, but it also has many of the properties of a liquid.

How is glass made?

- Glass is made by mixing sand, limestone and soda ash. Sometimes broken glass is added to the mixture.

Glass is a stable substance and has important properties that make it very versatile – it can be used for many different things.

Glass does not weather.

Glass will not dissolve in water or most chemicals.

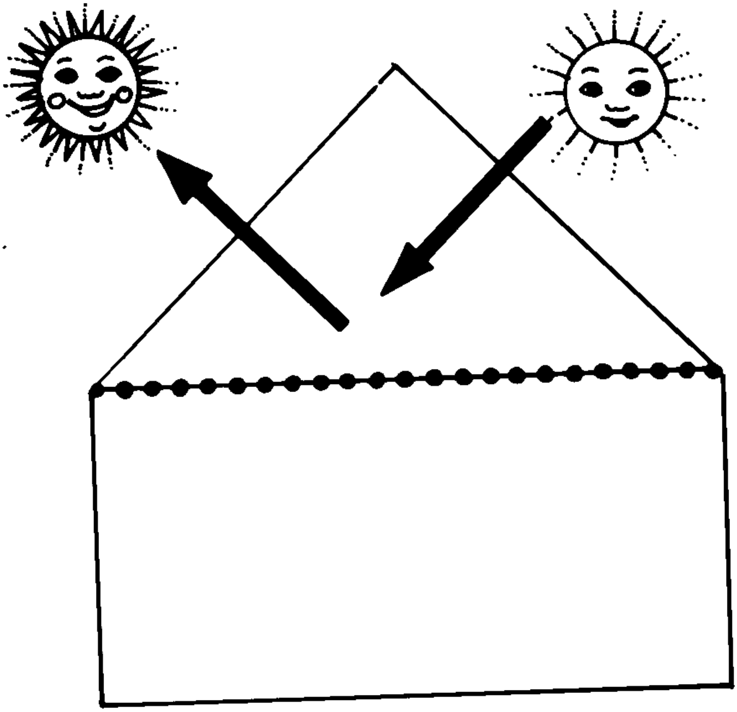
Glass can be used as containers for most foods and drinks.

Glass is transparent. Light can shine right through it.

Glass has a smooth hard surface that is hygienic and is easily cleaned for storing foodstuffs.

Glass can break easily but is also flexible if stretched into long fibres. These fibres are very strong and can be used to make many things, e.g. a canoe or a surfboard.

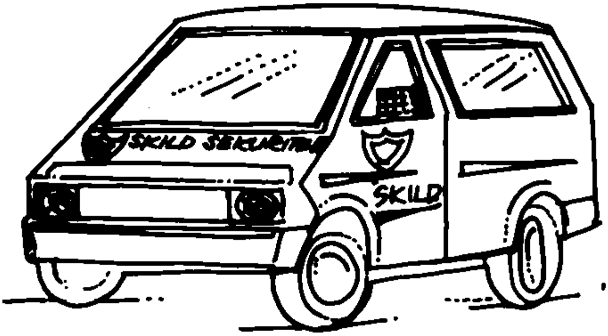
Layers of glass fibre can be put between the ceiling and the roof of a house to serve as insulation. What does this mean?



On a warm day it keeps out heat and so the house is cooler. On a cold day it keeps the heat in and the house is warmer.

Changing the composition of the mixture can change the properties of glass.

Special types of glass can be made, e.g. *safety glass* is used for car windows. When this glass breaks it crumbles into pieces that is held together by plastic (see sketch).



This is how a car window is made.

Glass Plastic Glass

Does the windscreen stay in one piece even if it has broken?

Why is this important?

Can you think of other places where glass plays an important role?

Interesting facts:

Nowadays we use windows in our houses. Before people knew about glass there were just holes in walls to let the light in. Houses were very dark inside. The Romans were the first to use glass for windows, but it was only in the 19th century that most people could afford to have glass in their windows.

Modern houses have larger windows and even glass doors to give homes a warmer feeling.

Assessment

LEARNING OUTCOMES(LOs)

LO 1

SCIENTIFIC INVESTIGATION

Learners respond confidently to their desire to learn about natural phenomena; they investigate relationships and solve problems within the context of science, technology and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

- 1.1 plans investigations;
- 1.2 takes the lead in investigating and

  collecting data;
- 1.3 evaluates data and communicates findings.

LEARNING OUTCOMES (LOs)

LO 2

CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

Learners know, interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

2.1 recalls significant information;

2.2 categorises information.

LEARNING OUTCOMES (LOs)

LO 3

SCIENCE, TECHNOLOGY AND THE ENVIRONMENT

Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS (ASs)

We know this when the learner:

3.1 understands science and technology in the context of history and personal knowledge;

3.2 understands the impact of science and technology.

Memorandum

Dictionary work

- Ten thousands: multitude, many
- Unemployed: without work
- Accommodation: place to live
- Refuge: shelter
- Structure: building method, composition, combination
- Shelter: protection
- At present: now

Compare normal houses to squatters’ huts

- Conclusions

- Strongest: House

Why

A house has sturdy foundations of cement and bricks. The walls are of cement, bricks and steel. The roof has a wooden frame with heavy tiles / asbestos sheets. Windows have sturdy frames with glass panes.

Surroundings of squatters' huts

Yes – where houses aren't usually built, Tends to be wet in the rainy season; sometimes close to water to use the resource – if heavy rains fall then there are floods. Sometimes sandy where nothing grows. Near to industrial areas – perhaps close to work.

Oil producing countries:

- Canada
- USASouth America
- China
- Middle East
- Russia / former Soviet Union

Plastic containers:

- Ice cream; toothpaste; cleaning agents; juice; shampoo

Plastic in housing:

- Plastic can be fastened over the roof to keep out the rain.
- It can be put around the structure of the house or inside against the walls.

- It can be put on the floor to keep out the damp.

Recycling of plastic:

Learners' feed back should be mainly about non-soluble plastic that causes pollution in nature.

- It can be burnt to provide energy and heat.
- It can be melted and used again.
- Causes the death of aquatic animals – fish are entangled.
- Animals (e.g. ostriches) swallow plastic.

Car window with plastic

- To protect the occupants from being cut.
- The plastic layer keeps the glass together even though the glass has crumbled.

Reinforced glass:

- The side windows crumble and protect the occupants against cuts.

Oven dishes; in hospitals – thermometer – can be sterilised – clean; glass fibre boats; vehicle windows (reinforced glass) church windows; window panes; glass fibre in the roofs of houses; vehicle lights; etc.

New discoveries in materials

NATURAL SCIENCES

Grade 5

QUALITIES AND USES OF MATERIALS

Module 30

NEW DISCOVERIES IN MATERIALS

ACTIVITY 1

To give examples of new discoveries related to materials

[LO 1.3; LO 1.3.1; LO 1.3.2]

- In this module you have been introduced to just a few materials. In the future we will get to know about exciting developments in the science of materials.

Plastic

It has been recently discovered that plastic can stand very great heat – up to 2 700 degrees Celsius. This equals the heat created by a nuclear explosion.

The properties of this type of plastic were tested in the following way:

An uncooked egg was coated with a layer of this plastic.

The egg was held in a welding flame.

The egg remained uncooked.

Directly after the flame was removed the egg could be held in the hand.

Seaweed

Have you seen seaweed being picked up on the beach and taken away in trucks? Have you wondered where it is going?

Let’s take a look:

The seaweed is taken to a factory where a very light, solid material is extracted from it. This material is so light that even a light breeze can blow it away. Because it is made from seaweed it is not harmful. One could even eat it.

Very soon this material will be used for:

insulation in fridges;

packaging of fragile items;

the covering for capsules.

New materials are continuously being created.

Sometimes these materials are created by chance and sometimes even from everyday materials.

Try the following:

Ingredients

500 mℓ skimmed milk

5 mℓ teaspoon of bicarbonate of soda

vinegar

pot

glass bowl

old spoon

Method

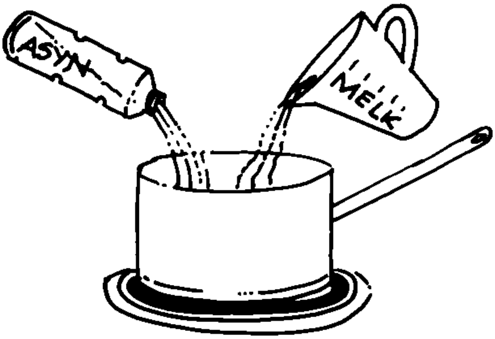
1. Mix the milk and vinegar in the pot. Heat the mixture slowly until all lumps have disappeared.

2. Pour the milk into the glass bowl and allow to cool. Now you should have a large rubbery lump in the glass bowl. Pour off the liquid that covers the lump.

3. Mix the lump with 25 ml of water and a teaspoon

of bicarbonate of soda. Now you have glue. Test the glue by sticking two pieces of paper together.

4. Conclusion: Draw your own conclusion.



Activity 2:

To name a few materials that are used in transport

[LO 3.1]

In space

- Spacecraft have developed very much over the last forty years. Powerful rockets, satellites and

> spacecraft have been built to explore space. Many communication satellites orbit the earth. They send information, television broadcasts and telephone calls around the earth. Astronauts first landed on the moon in 1969. Special materials had to be invented to withstand the extreme conditions in space. Titanium and aluminium, which are very light, are used in the construction of spacecraft. Stainless steel is also used as it is strong and can resist heat.

On land

The first bicycle was made of wood.

Today there are more than 800 million bicycles.

Metals such as steel, aluminium and titanium are used to make bicycles.

The first motorcars were just horse carts without horses, but with an engine.

A framework of wood and iron was used for the wheels.

In the 1950’s new, stronger steel was created which could be more easily shaped. It could be covered by a special material to make it rust resistant for at least ten years.

Today plastic is used in many cars for parts such as the bumpers.

The marvel of discovering new materials lies ahead in our future. Perhaps you will be inspired so as to discover a new material. Best of luck on your journey through science.

Assessment

LEARNING OUTCOME 1:

SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena and to investigate relationships and solve problems in scientific, technological and environmental contexts.

ASSESSMENT STANDARDS

We know this when the learner:

1.2.1 follows instructions for setting up apparatus and executing observations;

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1.3 evaluates data and communicates findings: provides feedback on progress in group context, as well as the eventual result:

1.3.1 presents data obtained from observation that are relevant to the target question.

LEARNING OUTCOME 3:

Science, SOCIETY and the environment Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS

We know this when the learner:

3.1 understands science and technology in the context of history and indigenous knowledge:

3.1.1 describes traditional shelters and connects some features of such shelters with modern dwellings.

Memorandum

Activity 1

Conclusion: When some materials are combined a new material with new properties can result.

NATURAL SCIENCES

Grade 5

ENERGY AND CHANGE

Module 31

Forms of energy

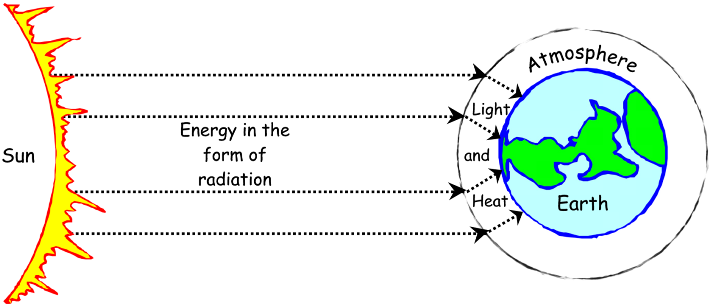
ACTIVITY:

To be able to differentiate between the various forms of energy

[LO 2.1]

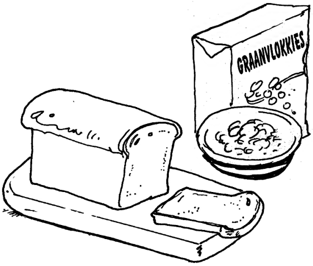
- In Grade 4 you became aware of the sun as the most important source of energy.

The energy of the sun reaches us in the form of radiation, light and heat.



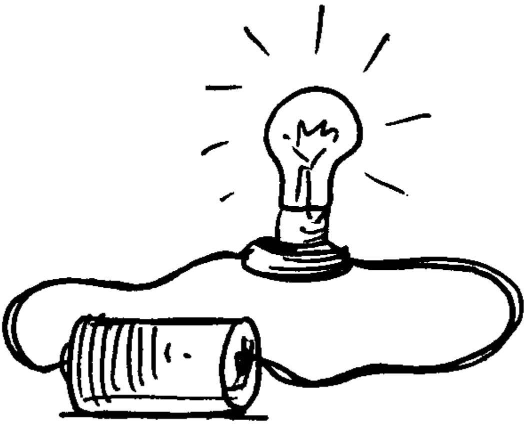
Now let’s see in which other forms energy occurs.

Energy in stored form



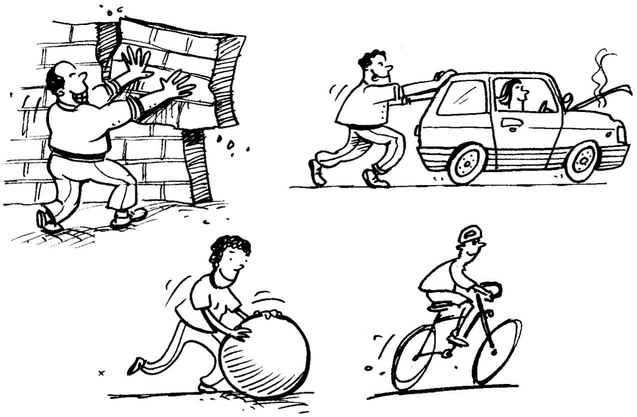
The sun’s energy is taken up by the plant and stored in food. Energy is therefore in food in a stored form. Animals and people eat the plant for nourishment and use the energy. Plants from millions of years ago that were not eaten by animals changed into coal. Stored energy therefore also occurs in coal and oil.

Energy is also stored in electrical cells (batteries). When the cell is connected to a light bulb, energy is released.



Kinetic energy

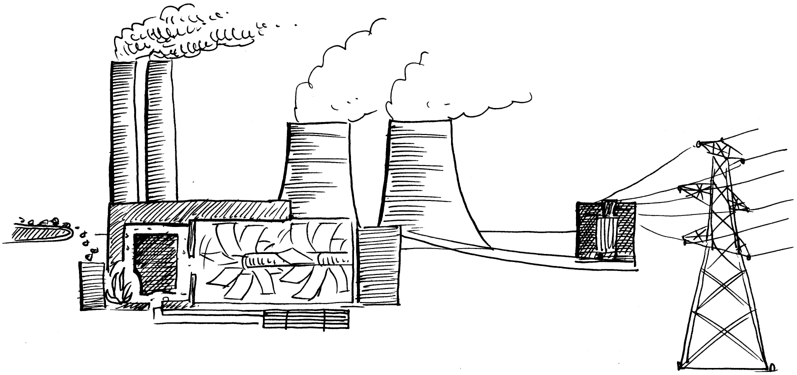
Energy can be used to get something moving, like when a person is running, for instance, or a wheel is rolling or an engine is turning. We could also speak of this as mechanical energy.



Sound energy

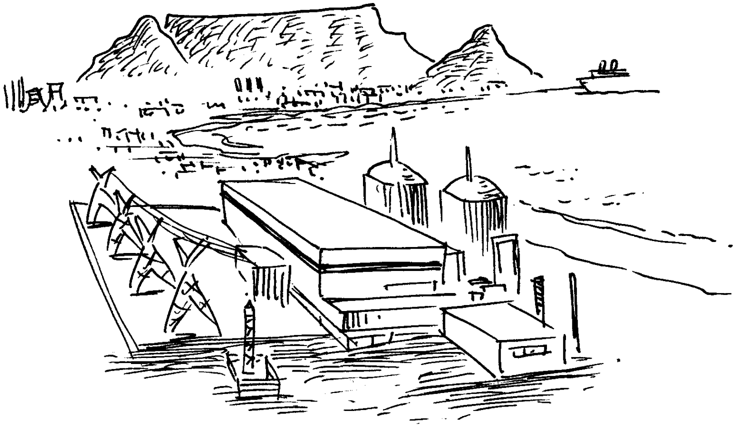
Sound reaches your ear in the form of waves travelling through the air. The sound waves set the eardrum vibrating and your brain perceives the vibration as sound. We refer to the energy that causes the vibration of the eardrum as sound energy.

Electrical energy



An electrical current is a quantity of energy that flows from one point to another. The strength of the current (amount of energy) is measured in amperes (A).

Atomic energy



You would have heard of nuclear power and nuclear power stations. Nuclear power is the energy that occurs in atoms. Atoms are the smallest particles of matter from which substances are made. Matter is a substance that is visible or has mass that can be weighed, e.g. gold, water, and copper. Do you know anything about uranium?

Conversion of energy from one form to another.

You have been learning about the different forms in which energy occurs. Do you think that energy that occurs in a specific form can be converted to another form of energy? Think about two of the forms of energy that we have discussed when you try to answer this question.

Assessment

LEARNING OUTCOME 2:

ConstructinG scienCE knowledge The learners will know and be able to interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS

We know this when the learner:

2.1 recalls meaningful information: the minimum requirement is the ability to describe the features and characteristics of objects, materials and organisms in simple terms.

2.1.3 say whether energy can be converted from one form to another.

Memorandum

Conversion of energy: Yes. There are many examples, e.g.

Sunlight energy that is used for nutrition by plants. Thus heat / light / radiation energy is converted to stored energy.

Energy in stored form can be converted to any other form.

Electrical energy is converted to light / heat energy.

Electrical energy can be converted to sound energy.

Atomic energy can be converted to electrical energy.

The effect of energy on substances

NATURAL SCIENCES

Grade 5

ENERGY AND CHANGE

Module 32The effect of energy on the condition of a substance

[

ACTIVITY 1:

To explain why energy can determine the

condition of a substance

[LO 2.1]

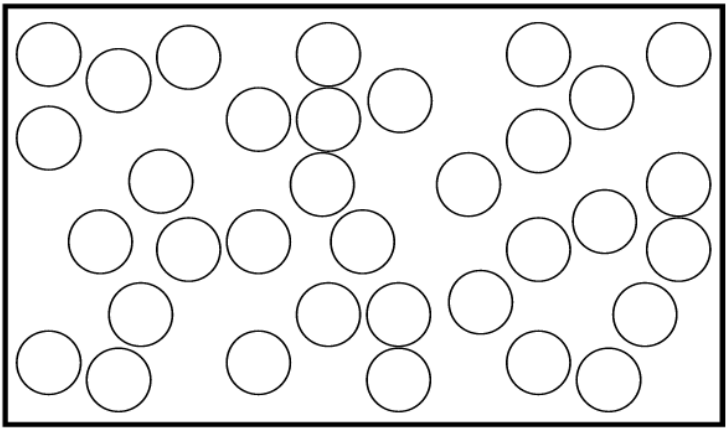
- Objects in the world around us become larger (expand) and smaller (contract) because of varying temperatures. Most substances (solids, liquids and gases) expand when they are heated and contract when they are cooled.

All matter around us consists of very small particles (atoms) that constantly move back and forth and collide with each other. These particles and their movements are so minute that we are unable to observe it. To our eyes, a piece of iron looks like a hard, solid piece of metal, but even the hardest metal consists of moving particles (atoms).

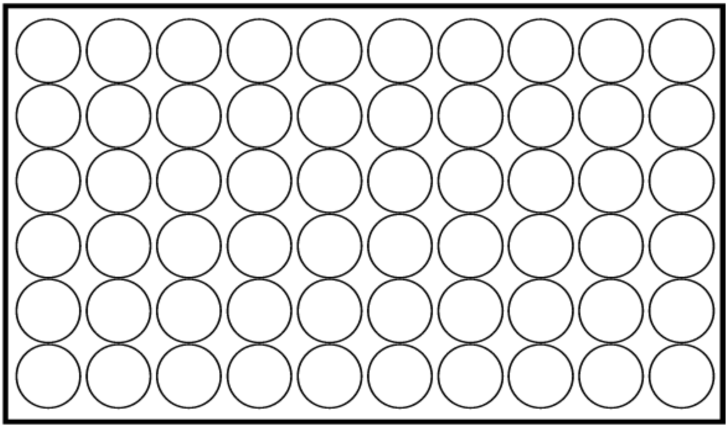
Matter expands because the particles (atoms) of which objects consist absorb energy when they are heated and therefore move around more. When the movement increases, more space is needed. Expansion therefore forces particles to move further away from one another.

When the temperature decreases (the matter loses heat), the particles have less energy and move at a slower pace. Because the movements are smaller, less space is needed and contraction occurs.

Expansion



Contraction



Let us have a look at how energy affects solid substances, liquids and gases.

Refresh your memory. Complete the following sentence by writing **solid substances** or **liquids** or **gases** in the spaces:

Under normal conditions (room temperature, normal air pressure)

has the same form as the container in which it is

kept, but the form of does not

change and most spread out in all directions and

fill the available space.

ACTIVITY 2:

To determine how energy affects solid substances

[LO 1.2.1; LO 1.2.2; LO 1.3]

Your educator will do a demonstration. Carefully observe what happens and answer the questions that follow.

- He takes a glass jar with pickled food.
- He tries to open the jar. Not all that easy, is it?

Why is this?

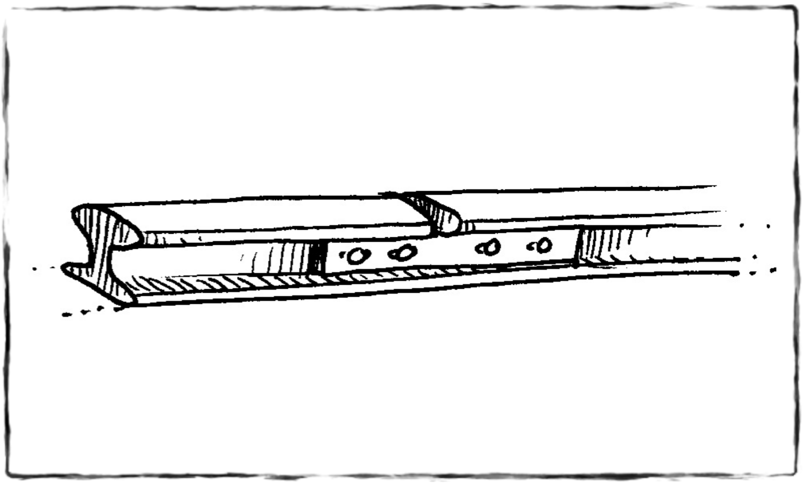
- He holds the jar under a tap and lets warm water run on the lid. He/she tries again to unscrew the lid.

Does it open more easily?

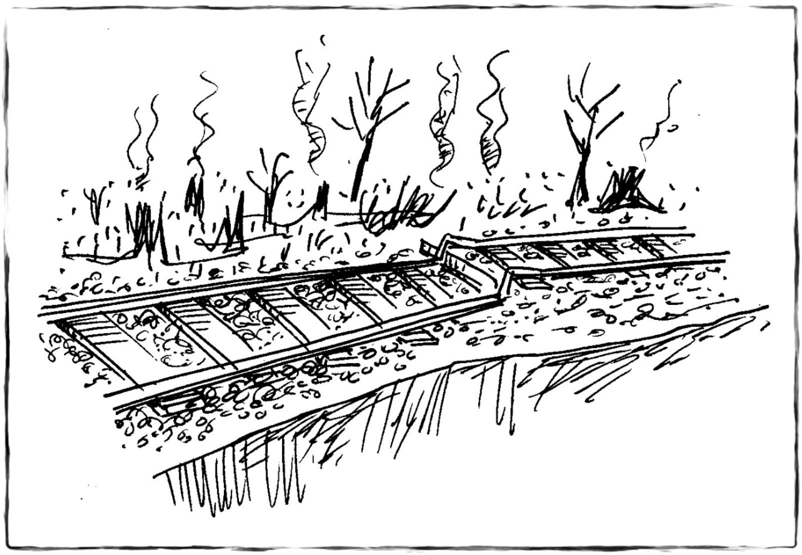
Explain:

- Now remember: solid substances expand when they are heated, but all solid substances do not expand equally much. Metals expand more easily than other substances.

Let us take a look at examples from everyday life:

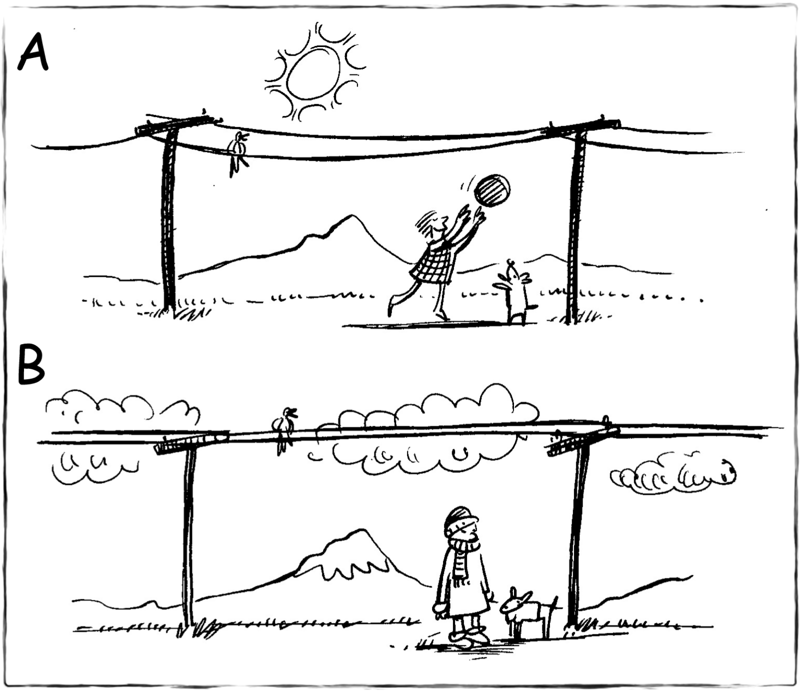


When railway girders are laid, spaces must be allowed at the joins because the metal will expand when it becomes warm (with rising temperatures) and the railway line would bend.



Windowpanes are cut smaller than their frames because both will expand on warm days and contract on cold days.

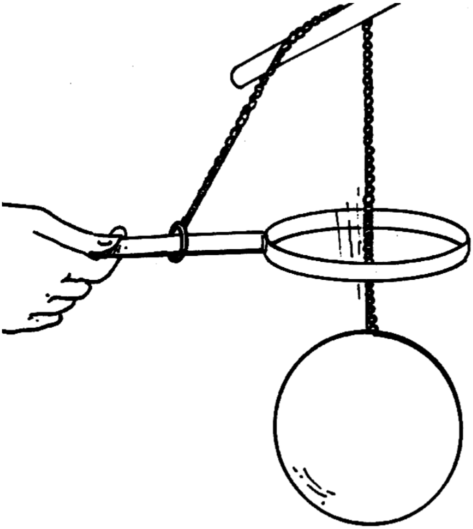
What would happen if the pane fitted the frame exactly?



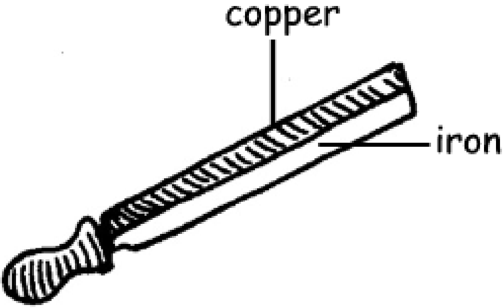
Do you notice how these pictures differ?

Explain the difference to a partner. Make your own deduction and write your response in the following space.

See if you can find the following in the science laboratory:



A copper ball-and-ring



A composite bar

1. Heat the composite bar over the flame of a candle or with a spirit lamp. What happens?

1. Which metal is on the outer side of the curve?

Can you explain why it is like this?

1. Heat the copper ball in the flame. Try to fit the ball into the ring. What happens? Explain it.

1. Let cold water run over the copper ball. Now see whether the ball is able to drop through the ring. What has happened? Explain this.

Complete:

All solid substances do not expand equally when they are

and they do not contract equally when they are .

More interesting facts:

Gaps are necessary when concrete slabs are laid for pavements. Why?

A dentist cannot simply use any material as a filling for a cavity.

Explain the reason for this:

Assessment

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ASSESSMENT STANDARDS

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2.1.3 say whether energy can be converted from one form to another.

Memorandum

Activity 1

Refresh your memory: liquids, solids and gases (in this order).

Activity 2

Difficult to unscrew: When the food was preserved, it was hot. The lid was screwed on tightly. Because it is made of metal, it shrank when it cooled down. The food also shrank. This means the lid became smaller and was sucked down tightly by the shrinking food.

Hot water makes it easy to open: solids do not expand to the same extent. The lid is made of metal and expands more than the glass. When the hot water flowed over the jar, the lid expanded more than the glass and it could be unscrewed without much effort.

A tight-fitting pane: the pane can crack because it expands when it becomes hot and is constricted by the frame.

Telephone wires: the wires become longer when it is hot. They may have been put up on a cold day, and when it becomes hot, they hang loose.

Composite rod:

1. The rod bends.

2. Copper expands more rapidly than iron.

Therefore it becomes longer than the iron and the curve is towards the iron side.

3. The ball does not go through, because it has expanded through heating.

4. The ball has cooled down and shrunk.

Fill in:

Heated, cooled.

Something interesting:

Concrete expands when it becomes hot. Therefore it will crack in order to move out of position if it has no space in which to move. It must be a material that reacts to heat in the same way that teeth do, otherwise it would expand or shrink more rapidly. It would cause it to become loose, or the tooth could crack.

How energy affects liquids

NATURAL SCIENCES

Grade 5

ENERGY AND CHANGE

Module 33

HOW ENERGY AFFECTS LIQUIDS AND GASES

ACTIVITY 1:

To determine how heat affects water:

[LO 1.2.1; LO 1.2.2; LO 1.2.3; LO 1.3.1; LO 2.1]

An investigation to determine how heat affects water:

Form groups of six and do the following:

1. Collect the following:

an empty plastic bottle

a cork that can be used to close the bottle

a drinking straw

a piece of paper

dye to colour the water

water

a kettle or any other appliance for boiling water

a plastic basin that is big enough to hold the bottle (big enough for two or three bottles).

1. Fill the bottle with water.
2. Add dye to the water and shake until it is mixed properly.
3. Make a hole through the cork and insert the

straw through it (the straw should fit tightly).
4. Seal the bottle, using the cork. Ensure that the liquid in the bottle rises slightly into the straw. (This will happen when you cork the bottle, if there is enough dye.)
5. Cut two slits in a piece of paper and thread the paper onto the straw, positioning it in line with the water level.
6. Boil a kettle of water.
7. Pour the boiling water into the plastic basin and place the bottle of dyed water into it.

Write down what you observe.

Discuss what you observe and write down the group’s statement of the events:

Now replace the warm water in the basin with cold water. What happens?

Explain:

Make a sketch of the apparatus and indicate what happened. Supply the necessary captions.

For you to find out:

1. We measure the temperature of matter (the

degree of heat of the matter) with a thermometer. Find out how a thermometer works and write down your explanation (it is based on the effect of energy on matter). Draw a simple sketch to illustrate your answer.

1. Liquid fuel such as petroleum expands when it is heated. Why would a motor vehicle be dangerous if the manufactures did not take a range of set precautions?

What can they do to solve the problem? Hint: it has something to do with the petrol tank.

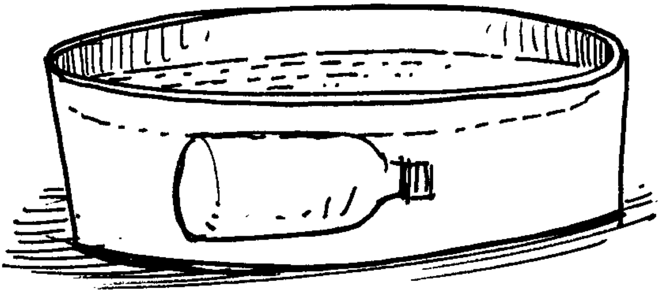
ACTIVITY 2:

To determine how energy affects gases

[LO 1.2.1; LO 1.2.2; LO 1.3.1; LO 2.1]

Select a partner and do the following investigation to determine how energy affects gases.

1. Use an empty cool drink bottle similar to the type that comes with lunchboxes.
2. Screw on the cap.
3. Pour hot water into a basin. Take care to not burn yourself.
4. Place the empty bottle into the hot water. Try with a stick to push it below the surface and keep it there for about two minutes.



1. What happens?

1. Explain why this happens (in your explanation, say whether the bottle was really empty).

1. Remove the bottle and cool it down in cold water. What happens?

1. Explain why it happens:

1. Deduction: there is in the bottle and it

when it is heated and when it is cooled.

Assessment

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2.1.3 say whether energy can be converted from one form to another.

Memorandum

Activity 1

The coloured liquid moves up into the straw.

The coloured water expands as a result of the heat, because the water particles get more energy and therefore move away further from each other; the glass of the bottle expands much less because solids do not expand as much as liquids; the water rises in the tube.

The coloured water in the tube drops.

The coloured water emits heat to the cold water in the bowl; that means that the energy of the particles decreases; they move less; the volume decreases.

Labels:

- straw
- paper marker
- cork
- bottle
- coloured water
- bowl with hot water

1. Thermometer

Labels:

- bulb with mercury/coloured liquid
- tube
- scale

Function:

If the environment in which the thermometer is placed (e.g. a solution) is warm, the liquid in the bulb will absorb heat and expand; the liquid rises in the tube. If the solution is cold, the liquid in the tube will emit heat and shrink and the liquid will drop in the tube.

2. If it becomes warm, the petrol expands. If the tank does not have an opening, the petrol cannot expand and the tank bursts.

Motor manufacturers install a tube near the petrol tank inlet.

Activity 2

5. The bottle becomes distended.

6. There was air in the bottle, therefore it was not really empty; the air absorbed energy in the form of heat, the particles started moving more / collided harder against each other, and the air expanded.

7. The bottle shrinks to its normal size. If the water is very cold, it might even become indented.

8. The air particles lose energy in the form of heat, move less and the air shrinks. If the water is colder than the air was when the lid was screwed on, the bottle will become indented.

9. Air; expands; shrinks.

The wonderful nature of water

NATURAL SCIENCES

Grade 5

ENERGY AND CHANGE

Module 34

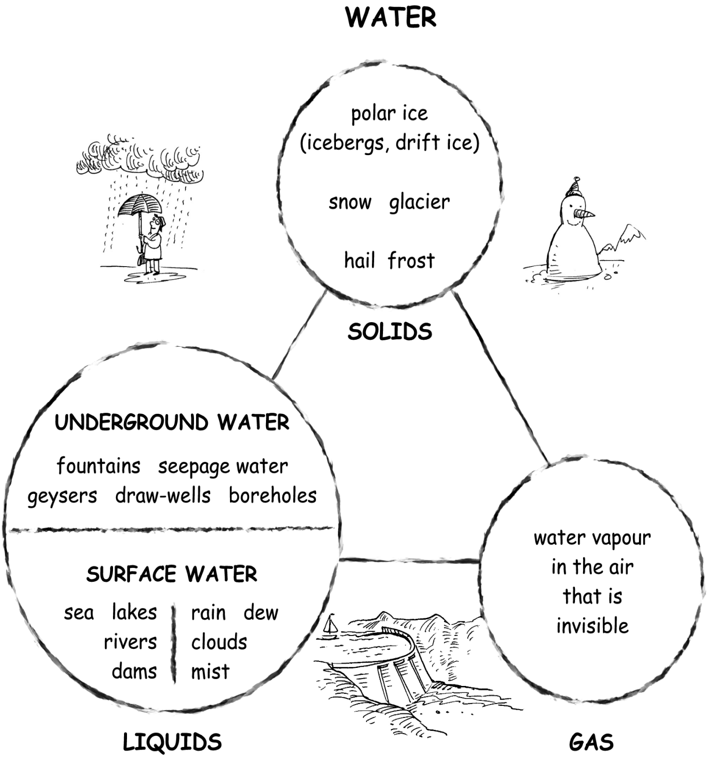
THE WONDERFUL NATURE OF WATER

ACTIVITY:

Energy and water: To explain the wonderful nature of water

[LO 1.2.1; LO 1.3; LO 2.1]

Where in nature do we find water?



Deduction from the diagram: water occurs in nature as solid, liquid and gas.

Demonstration by educator to illustrate the effect of energy on water:

1. Requirements:

a pot

a container filled with ice cubes

a glass

a gas stove

matches

1. Place the pot containing the ice-cubes on the stove. Ignite the gas stove and

heat the ice. What happens?

The solid substance has changed to a .

1. Heat the liquid (water) further. What happens?

The liquid changes to a .

1. What will happen if you continue to boil the water?

1. Explain the changes that took place by making use of the following words:

solid energy

liquid thermal energy

gas flame-energy

particles evaporation

move condensation

What happens when condensation cools down?

Use a dry glass. Fill it with ice cubes and leave it to stand for a while. What do you notice on the outside of the glass?

What happened?

Complete:

The in the air CONDENSED against the cold surface

of the glass and formed . This happened because

the particles of the lost a substantial amount of

and therefore experienced less movement.

Collect the drops that form against the glass in a small bowl and place it in a freezer. What happens?

- Refresh your memory:

Fill in **energy gain** or **energy loss**:

SOLID LIQUID GAS

GAS LIQUID SOLID

Assessment

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Memorandum

Activity

Demonstration by educator:

2. The ice melts; a liquid

3. The water boils and water vapour is formed.

4. The water boils away.

5. Ice is water in solid form; the particles have little energy and therefore they move only slightly; when it is heated the flame supplies heat energy, the particles acquire energy and move away from each other and the ice melts and becomes a liquid (water); the liquid particles acquire more energy, they move so much that they form a gas (water vapour). Evaporation takes place as a result.

A vapour forms against the glass. The particles of the water vapour in the air lost energy when they came into contact with the cold glass, and they formed water against the glass.

Complete:

- water vapour; water; water vapour; energy/ heat energy
- Ice forms.

Refresh memory:

- energy addition
- energy reduction

Energy as a source of heat

NATURAL SCIENCES

Grade 5

ENERGY AND CHANGE

Module 35

THE USE OF ENERGY BY HUMANS

ACTIVITY 1:

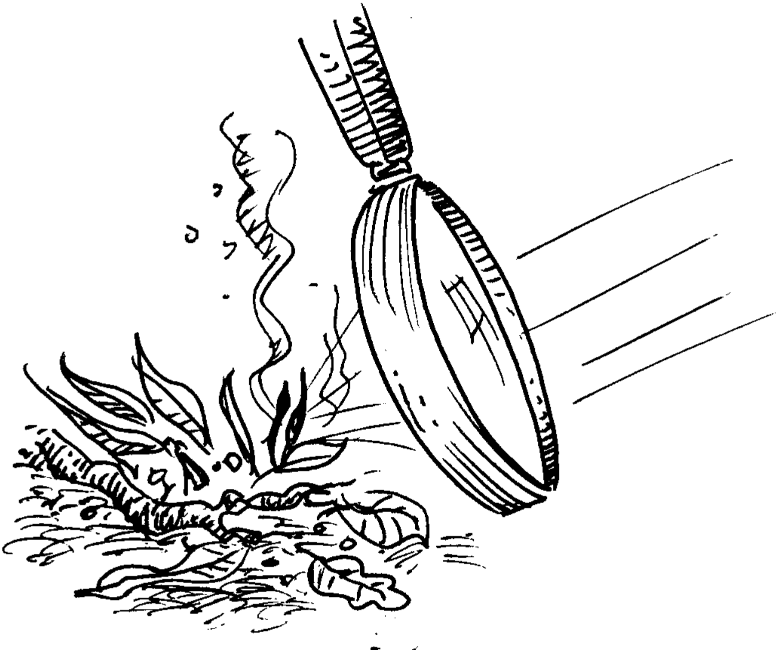
To discuss energy as a source of heat

[LO 1.3.1; LO 2.1]

Let us take a look at how we can make use of direct sunlight.

- Do this exercise first to determine the POWER of the light of the sun. (POWER has to do with how much energy it has)

Use a magnifying glass to burn your name onto a sheet of paper.



Describe what happened (use the words solar energy, concentrate, heat, burn):

Why should empty glass bottles not be left lying around in the veld?

Activity 2:

To use solar energy to heat water by means of solar panels

[LO 3.1.1]

These solar panels collect the thermal energy of the sun. This simple method can supply a house with warm water without the use of electricity. The panels consist of long pipes that lie folded against each other to increase the surface that gets radiated as much as possible. The pipes are linked to the water system in the house.

Unfortunately the sun does not shine all day and the heat that is radiated in some seasons, e.g. during winter, is not adequate. We therefore have to make plans to also make use of other sources.

Activity 3:

To use stored energy for heating

[LO 3.1.1]

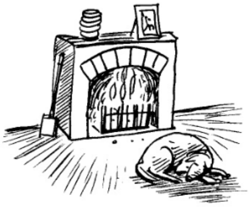
In the past the most common way of obtaining warmth was to burn some substance to release the stored energy as warmth or heat.

Wood is still used for this, particularly in rural areas. Open fires and fires in fireplaces or drums supply many people with heat in winter. South Africans are also known for their love of braaiing.

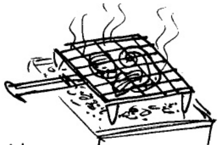
Unfortunately people often use valuable wood that is collected from the veld. This wood should be left to decay so that the valuable substances in it can return to the soil from which the tree obtained it. If the wood is collected and burned, the soil is impoverished and plants will eventually not be able to grow in it. This results in disturbance of the natural balance and causes deviations like the warming of the earth.

Fortunately people also often use wood from trees that are planted in plantations.

drum



fireplace



grid

Coal is burnt in some old-fashioned stoves and fireplaces to generate heat to cook food or to release warmth. It is interesting to realise that this actually means that we release solar energy that was stored millions of years ago!

Paraffin is still widely used by people in remote areas. These areas often do not have electricity yet and the people make use of Primus stoves. Paraffin is burnt in the unit to release energy that cooks the food.

Describe in five sentences how the people's methods to release stored energy by combustion, has improved over course of time.

Activity 4:

To use friction to supply energy

[LO 1.1.1; LO 3.1.1]

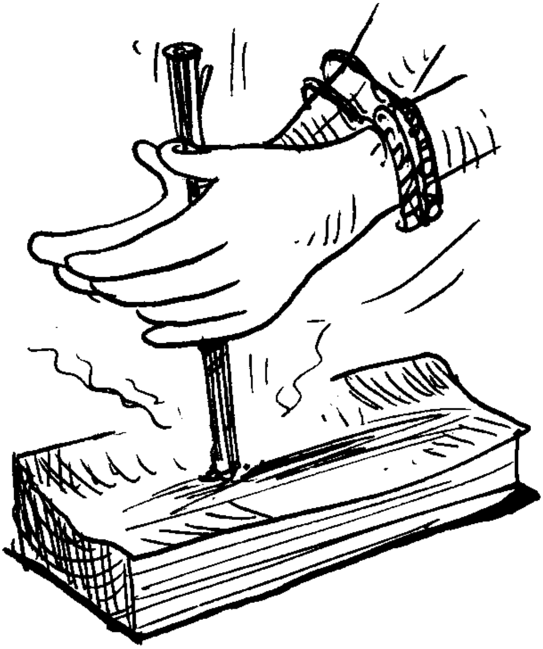
- Friction can also be used to release stored energy in the form of heat.

Rub your hands together hard and fast. What do you feel?

Place a piece of sandpaper against a piece of wood and rub it hard and fast against the wood for ± 20 seconds. Can you feel that your fingers feel heat?

Now list some more examples where heat is released through friction:

How did cave dwellers start a fire by means of friction?



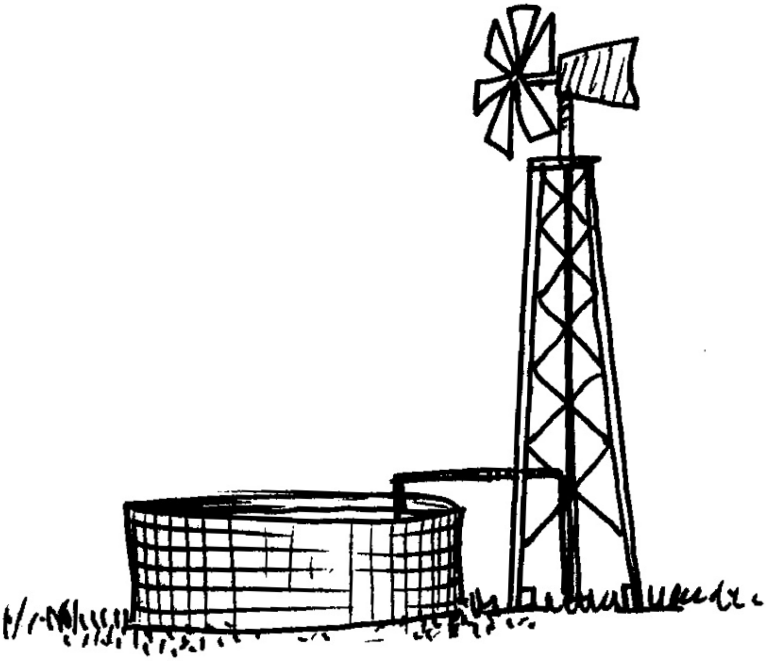
Activity 5:

To use energy for mechanical purposes

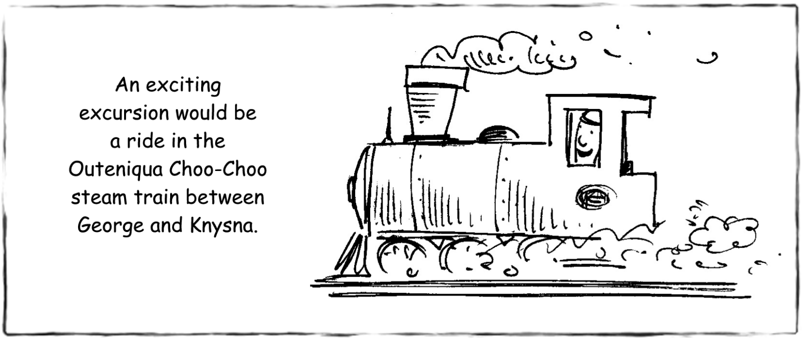
[LO 2.1]

- Mechanical systems such as engines cannot function without energy. In the past a lot of the energy was obtained directly from nature.

Wind mills work, for example, with wind.



Steam trains were used (from 1712 until the 1900s) to transport people and goods. Coal was burnt to heat water that released steam. The steam was used to drive the engine that turned the wheels. You can visit the museum in George where old steam locomotives are exhibited.



An exciting excursion would be a ride in the Outeniqua Choo-Choo steam train between George and Knysna.

Think of three more examples where energy is applied for mechanical purposes and describe each one briefly.

Assessment

LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONSThe learner will be able to act confidently on curiosity about natural phenomena and to investigate relationships and solve problems in scientific, technological and environmental contexts.

ASSESSMENT STANDARDS

We know this when the learner:

1.2.1 follows instructions for setting up apparatus and executing observations;

1.2.2 collects data from observation by means of sketches and labels;

1.2.3 perseveres until a result is obtained or continues to observe over an extended period of time;

1.3 evaluates data and communicates findings: provides feedback on progress in group context, as well as the eventual result:

1.3.1 presents data obtained from observation that are relevant to the target question.

LEARNING OUTCOME 2: CONSTRUCTING SCIENCE KNOWLEDGEThe learners will know and be able to interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS

We know this when the learner:

2.1 recalls meaningful information: the minimum requirement is the ability to describe the features and characteristics of objects, materials and organisms in simple terms.

2.1.3 say whether energy can be converted from one form to another.

LEARNING OUTCOME 3: SCIENCE, SOCIETY AND THE ENVIRONMENTLearners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS

We know this when the learner:

3.1 understands science and technology in the context of history and indigenous knowledge:

3.1.1 describes traditional shelters and connects some features of such shelters with modern dwellings.

Memorandum

Activity 1

The magnifying glass concentrates the sunlight energy onto one point; thus the heat is concentrated and the paper is ignited.

Parts of the bottle, especially the bottom, function as a magnifying glass and can start a fire.

Activity 3

Initially only wood was used. A lot of wood is necessary because wood does not burn for long. Open fires were used and a lot of heat was lost. Later the fires were made in containers. The coal was used. Coal burns longer than wood. Paraffin is needed in even smaller quantities. Learners can expand on this topic and mention things that have not been referred to in previous paragraphs.

Activity 4

The hands become warm.

Any examples: tyres on tar, spacecraft entering earth’s atmosphere; engine that is running without oil; fishing line that runs swiftly over one’s finger;

drilling into wood or iron: smoke forms as a result of the heat; a match drawn against the side of the box (in earlier times against the sole of a shoe); cigarette lighter.

A thin stick was twirled between the palms while its point rested in a hole or hollow in a larger piece of wood. The hole caused the friction area to be greater. The thinner wood eventually ignited.

Activity 5

Petrol/diesel engines: the energy in the fuel explodes and sets energy free; this creates pressure that makes the piston move and the engine turn.

Electrical equipment, for example a doorbell. The current creates forces that make the little hammer vibrate.

Water that makes a water-wheel turn, which then activates a mill.

A cyclist that transfers energy by pedalling which makes the wheels turn.

A person who turns a hand grinder, for example to mince meat.

Electricity as a form of heat

NATURAL SCIENCES

Grade 5

ENERGY AND CHANGE

Module 36

ELECTRICITY AS A FORM OF ENERGY

ACTIVITY 1:

To discuss electricity as a form of energy

[LO 1.1.1; LO 1.2.1; LO 2.1; LO 3.1]

The importance of electricity

In our modern society, life without electricity is unthinkable.

Make a list of daily activities for which you or your family use electricity.

Everyone might list the use of light. Let us take a look at our well-known light bulb.

- The light bulb is a good example of an invention that drastically changed the lifestyle of man. A person with the name of Thomas Alva Edison invented it approximately 100 years ago.

Bring an electric light bulb to school to help you with the following task.

- If you examine an electric light bulb, you will notice that the part that emits light is a fine wire, the filament. The filament is a very fine coil made of tungsten. Tungsten is a metal that does not melt easily when it gets hot and glows. There is no air inside a light bulb, only a harmless gas called argon, which prevents the filament from being destroyed when it burns.

The tungsten filament has to be long and thin to be able to glow brightly. Fitting a long enough filament into the globe requires it to be coiled. Because it is long, it is also relatively heavy for something as fine and it therefore needs the support of a stronger wire.

The power of the light bulb is indicated on the bulb in “watt”. Household light bulbs come in 40W (dim), 60W (the most generally used), 75W, 100W or 150W (the brightest).

Take a look now at the light bulb that you have brought with you.

1. The bulb is watt. What does it tell you?

1. How does your light bulb fit into the holder?

1. Look at the narrowest part of the light bulb. At which point does the power

enter the light bulb?

1. What is this section made of?
2. Why are the supporting wires separated by means of a glass support?

1. The tungsten filament is formed in a particular manner and supported by wires. Why?

1. Sketch your light bulb and supply the necessary labels. Refer to the story for help.

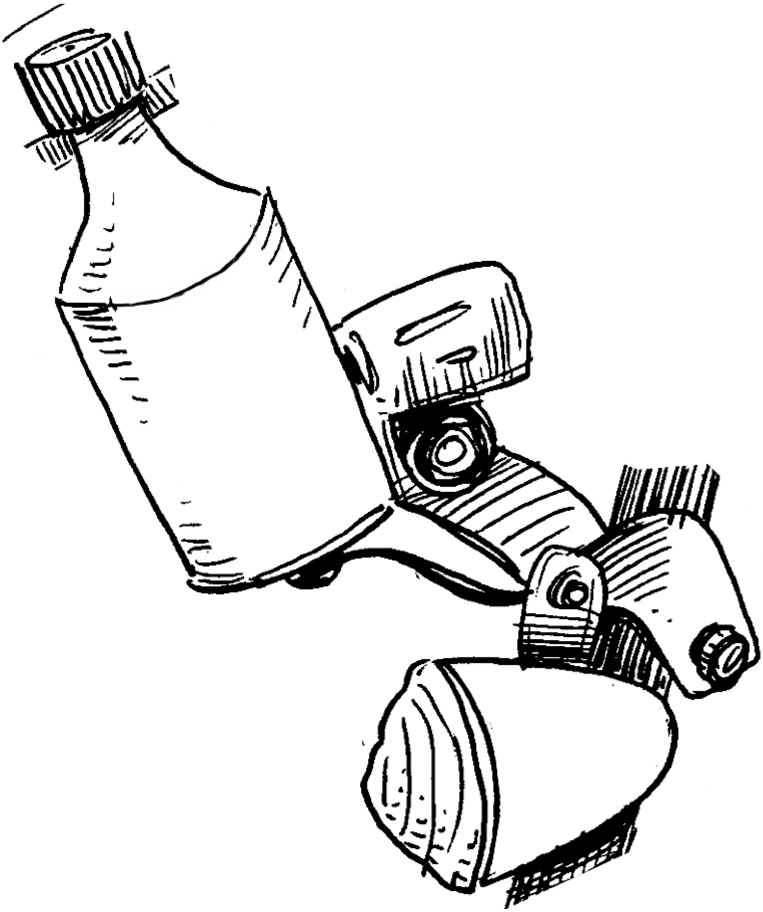
The generation of electricity

Remember that we use electricity to obtain ENERGY.

The advantage of electricity is that it makes us less dependent on fuels from natural resources. These fuels are being rapidly depleted. Let us take a look at a few manners in which electricity can be generated

- The dynamo

A dynamo can be used as a generator, for example by a cyclist at night. Do some research and explain briefly how a dynamo works. Remember to say where the energy comes from.

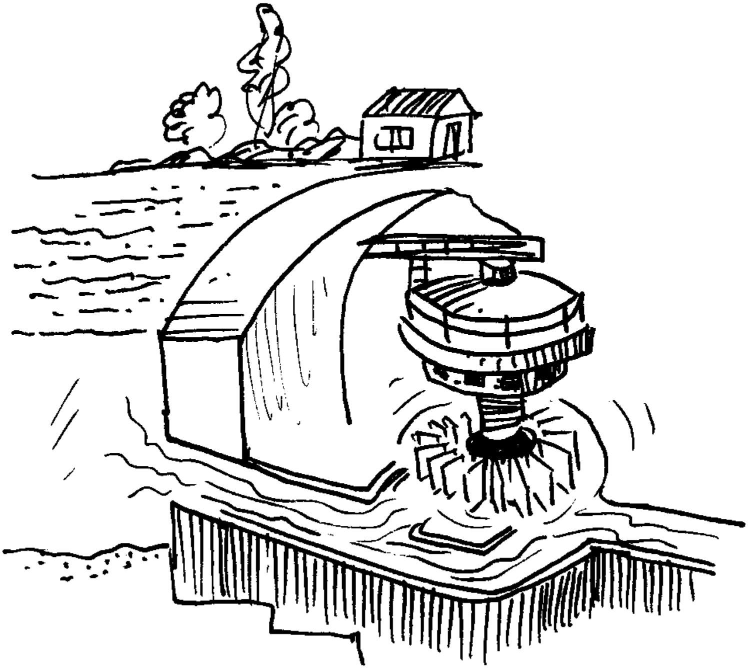


- Generating electricity by means of water in streams and rivers

A hydroelectric power station makes use of moving water to generate electricity. The water is led through pipes to turn turbines. The turbines turn generators (almost like the dynamo of the bicycle). The greater the pressure of the water that flows through the pipes, the more electricity is generated.

It is therefore important to ensure that enough water is dammed up by building walls across rivers so that the river water can accumulate behind the wall.

Cape Town obtains a portion of its electricity from turbines in the mountains near Somerset West.



- Assignment

Write ten sentences about each of the following:

- How people generated electricity in the past and how it is done today.

- How electricity has changed our lifestyle.

- Why it is important that all inhabitants of the country, also the poor and those living in remote places, have electricity available in their homes?

What is energy?

Activity 2:

To explain the term energy

[LO 2.1]

- The activities of this module will have prepared you for answering the following questions on energy. You will have to puzzle out some of the answers and make deductions from what you have learnt. Select a partner for this activity and be sure that you and your partner make correct deductions and provide correct answers by checking with your educator.

1. What is energy?

1. Can energy be converted from one form to another? If you say yes, give an example.

1. Can energy be created? If you say yes, give an example.

Assessment

LEARNING OUTCOME 1:

SCIENTIFIC INVESTIGATIONS The learner will be able to act confidently on curiosity about natural phenomena and to investigate relationships and solve problems in scientific, technological and environmental contexts.

ASSESSMENT STANDARDS

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LEARNING OUTCOME 2:

ConstructinG scienCE knowledge The learners will know and be able to interpret and apply scientific, technological and environmental knowledge.

ASSESSMENT STANDARDS

We know this when the learner:

2.1 recalls meaningful information: the minimum requirement is the ability to describe the features and characteristics of objects, materials and organisms in simple terms.

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LEARNING OUTCOME 3:

Science, SOCIETY and the environment Learners are able to show understanding of the underlying connections of technology, the community and the environment.

ASSESSMENT STANDARDS

We know this when the learner:

3.1 understands science and technology in the context of history and indigenous knowledge:

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Memorandum

Activity 1

The list is limitless, for example stove, refrigerator, light, electric razor, hair drier, kettle, toaster, starter of a car engine, etc.

Light bulb:

1. For example 100. How much energy is emitted by the lamp in the form of light, or how brightly the lamp shines, etc.

2. The bulb is inserted so that it fits tightly; two pins

hold the bulb in position. Or the bulb screws in and is held in position in this way.

3. Two little contact points or one point and the side of the part with the screw-thread (socket).

4. Metal that conducts electricity.

5. To prevent a short-circuit or to ensure that the current flows through the filament.

6. It is rolled up and is curved so that it is as long as necessary to provide the amount of light that is indicated by the Watt.

Labels:

- glass container
- filament
- supporting wires
- isolation glass
- socket
- connecting pins or screw-thread
- contact point(s)

Assignment:

These are open questions and it must be left to the learners to formulate their own ideas. Allow them to put across their ideas to the class and allow time for discussion.

Activity 2

1. Energy is the ability to do work.

2. Yes. Electrical energy in light energy or heat energy; stored energy in food to heat energy or motion energy; etc.

3. No. Energy comes from nature, mainly the sun, and one can merely convert it into a useful form.